DEVOTED TO
TEXTILE CHEMISTRY
AND
WET-PROCESSING
BLEACHING
DYEING
PRINTING
FINISHING

FEBRUARY 21, 1949
VOLUME 38, No. 4

AMERICAN DYESTUFF REPORTER

INCORPORATING TEXTILE COLORIST AND CONVERTER

PONTAMINE Fast Brown 8RL
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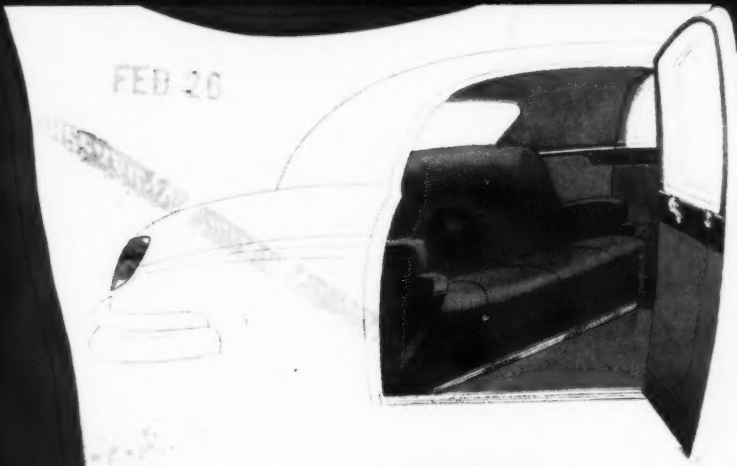

Excellent fast-to-light direct color for producing shades of bright reddish-brown on cotton and viscose-process rayon. Good fastness to dry cleaning and dry crocking. Especially useful for deep brown shades on drapery and slip cover materials . . . recommended also as a reddening element for taupe shades on automotive upholstery.

Readily soluble, penetrates and levels well. Can be applied in the customary types of dyeing equipment. For additional information, consult our Technical Staff. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Division, Wilmington 98, Delaware.

Du Pont Dyestuffs

DUPONT
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*Reg. U. S. Pat. Off.

by Dr. L. J. Armstrong, Textile Processing Consultant, Armour and Company

Fatty Amides: THEIR PROPERTIES AND THEIR USES

A primary amide may be described as a derivative of an organic acid in which the (OH) group has been replaced by an amino (NH_2) group. This forms a substantially neutral chemical called an amide ($RCONH_2$).

The name "Armid" is the Armour trade-name given to the general class of amides derived from fatty acids. Since fatty acids are all straight-chained molecules, the Armids are likewise straight-chained.

General Properties

These high molecular weight amides are high-melting, wax-like materials. The chemically pure amides are water-insoluble and neutral. Commercially, the Armids may contain a few percent of the unreacted fatty acids from which they are made.

The Armids vary in physical properties from a substance which can be flaked like stearic acid to a soft paste. The color of the saturated amides is lighter than that which can be obtained on the unsaturated amides.

Solubilities

The Armids are soluble in ketones, esters, alcohols, turpentine, mineral spirits, fats and fatty acids. They are not soluble in water.

In general, amides are insoluble or only slightly soluble in organic solvents at room temperature, and increase in solubility at high temperatures.

In the saturated series the longer the carbon chain of the amide, the less is the solubility. In each class of solvents, the higher the molecular weight of the solvent, the more amide it will hold in solution.

Chemical Properties

Unsubstituted amides react with ethylene oxide to yield mixtures of mono- and di-substituted amides (available commercially from Armour Chemical Division as "Ethomids") which range from dispersible solids to soluble waxes. Suitable choice of amounts of ethylene oxide give good wetting agents and excellent cotton detergents when properly formulated.

Reactions of amides with formaldehyde, depending on the conditions, may give methylol stearamide or methylene bis stearamide (Armowax). Methylol stearamide undergoes a number of interesting reactions leading to textile waterproofants, surface-active agents and high-melting waxes.

Amides may be chlorinated by reaction with a sodium hypochlorite. These compounds offer many interesting possibilities for further synthesis of wetting agents, textile softeners, waterproofing agents, detergents, etc.

Availability

The Armids which are available in quantity for commercial use are shown below in tabular form, together with their average composition and constants.

Technical information, samples and prices are available upon request. (Any indication of your particular field of interest will be helpful to our Technical Service Department in making recommendations.)

Textile Applications

Textile chemists are constantly striving to effect improvements in the appearance, durability and performance of yarns and fabrics. The Armids are playing an ever-expanding part in broadening the scope of the field of textile chemistry. While new uses are being discovered regularly, the Armids already have found acceptance in the following:

Emulsions: The Armids are emulsified with oleate soaps and applied to fabrics for their water repellent and softening properties. Similar emulsions are used in small quantities in starch sizing pastes and other gums to minimize sticking.

Emulsion Additives: Generally, Armids thicken, stabilize or increase spreadability of an emulsion when added to the extent of 1-5% on the basis of the oil phase to be emulsified.

Mutual Solvents: The Armids make many synthetic resins compatible with paraffin or microcrystalline waxes — make possible a wide range of unique compounds with certain of the desirable properties of both plastics and waxes.

Chemical Raw Materials: The Armids serve as starting materials for the synthesis of high-melting waxes, synthetic detergents, durable water repellents, cationic and non-ionic softening agents and other textile auxiliary agents.

High Molecular Weight Aliphatic Amides—Composition and Constants Chart

n-Primary Amides	Carbon Chain Length	Armid 8	Armid 10	Armid 12	Armid 14	Armid 16	Armid 18	Armid HT	Armid RO	Armid T	Armid TO	Armid C
Hexane	6	3	..	..	..	..	..	..	..	..	..	..
Octane	8	90	3	..	..	..	..	..	..	..	..	8
Decane	10	7	90	..	..	..	..	..	..	..	..	9
Dodecane	12	..	7	90	4	..	..	..	..	..	..	47
Tetradecane	14	..	..	9	90	..	..	..	..	..	..	18
Hexadecane	16	..	..	..	4	90	6	25	..	30	..	8
Octadecane	18	..	..	..	..	6	93	70	20	25	..	5
Octadecene	18	..	..	1	2	4	1	5	60	45	30	5
Octadecadiene	18	..	..	..	..	..	..	..	20	..	30	..
Substituted Cyclic	20	..	..	..	..	..	..	..	..	..	40	..
Approximate Melt Point °C		97	97	97	97	97	100	98	72	80	55	90
Approximate % Unreacted Fatty Acid		5	5	5	5	5	5	5	5	5	5	5

Please send a copy of the technical bulletin, "Armids (High-Melting Organic Chemicals)" to:

Name..... Title.....

Firm.....

Street.....

City..... Zone State.....

ARMOUR

Chemical Division

ARMOUR AND COMPANY

1355 W. 31st Street • Chicago 9, Illinois

American Dyestuff Reporter, Vol. 38, No. 4, February 21, 1949. Published every other Monday. Copyright 1949, by Howes Publishing Co., Inc., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00. Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

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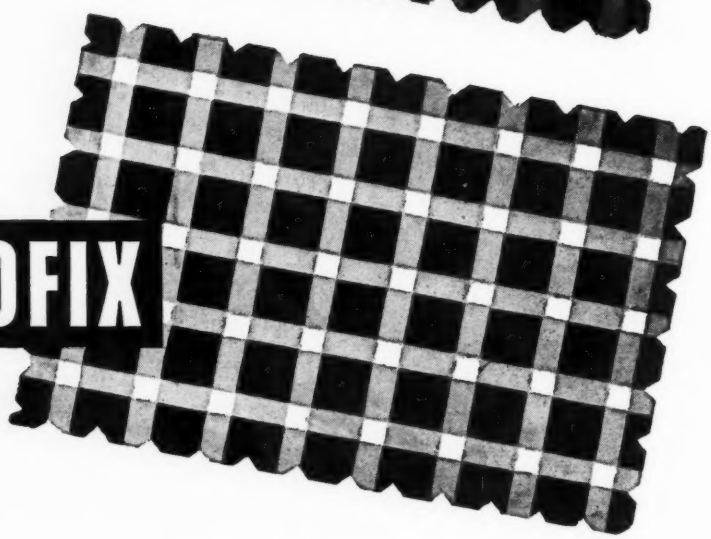
STOP COLOR BLEEDING

with *CULOFIX



Preserve crisp detail and contrast of prints by using time-tested Culofix as an after treatment.

Kill bleeding troubles no matter where they occur—in the finishing bath—batching up after dyeing—in cross dyeing, etc.

Improve water fastness of direct colors and impart a very desirable soft, full finish at the same time, thus eliminating an extra finishing operation. (Where no softening action is needed, Culofix L should be used.)

If fastness to water or prevention of color migration is essential to your direct color dyeings, write for Technical Service Bulletin #204-106.1. Our technical staff is at your service without obligation.

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Arkansas Co. INC.

Manufacturers of Industrial Chemicals for Over 40 Years

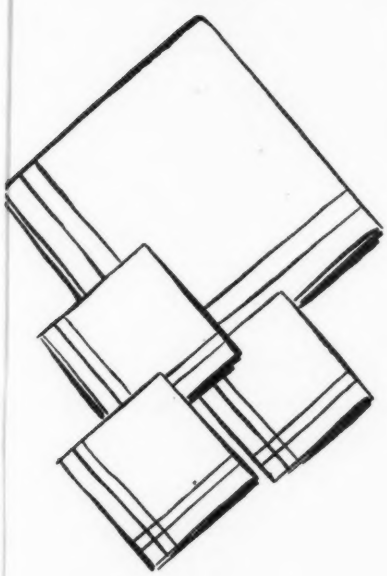
NEWARK, NEW JERSEY

A Newcomer To The Calco Line

CALCONYL DOUBLE SOLUTIONS

Stabilized Azoic Dyes

To its extensive line of textile dyes, Calco has now added an adequate range of reds and yellows for stabilized azoic printing. These CALCONYL* DOUBLE SOLUTIONS are highly recommended for cotton printing to produce full shades with good fastness to light, washing, dry cleaning, hot pressing and perspiration. They are especially recommended for printing on cotton dress goods, table cloths, handkerchiefs, towels and similar applications.



Since CALCONYL DOUBLE SOLUTIONS represent a very concentrated form of solution, they require less storage space and offer greater ease of handling and a HIGH DEGREE OF STABILITY IN STORAGE. Under normal plant conditions CALCONYL DOUBLE SOLUTIONS will not precipitate or separate on long standing.

Your Calco representative will be glad to recommend the particular type of dye that will most efficiently meet your specific needs.

CALCONYL DOUBLE SOLUTIONS

Calconyl Yellow 2GR Double Solution
Calconyl Yellow G Double Solution
Calconyl Golden Yellow R Double Solution
Calconyl Scarlet R Double Solution
Calconyl Red G Double Solution
Calconyl Red R Double Solution

*Reg. U. S. Pat. Off.

AMERICAN Cyanamid COMPANY
CALCO CHEMICAL DIVISION
BOUND BROOK, NEW JERSEY

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Run Resistance

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JOAN STANTON

The young lady who is having difficulties with her dog says, "I don't believe any girl expects hosiery not to run at all. We do expect it to last through enough wearings so that we'll feel we got our money's worth."

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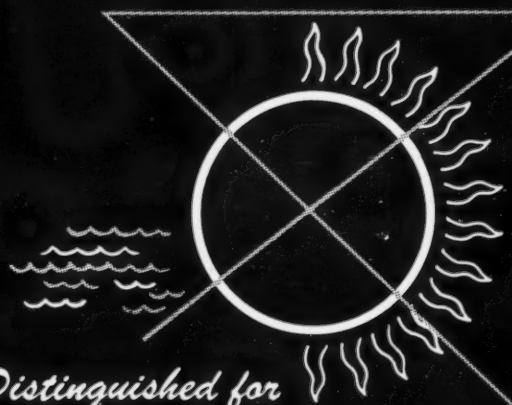

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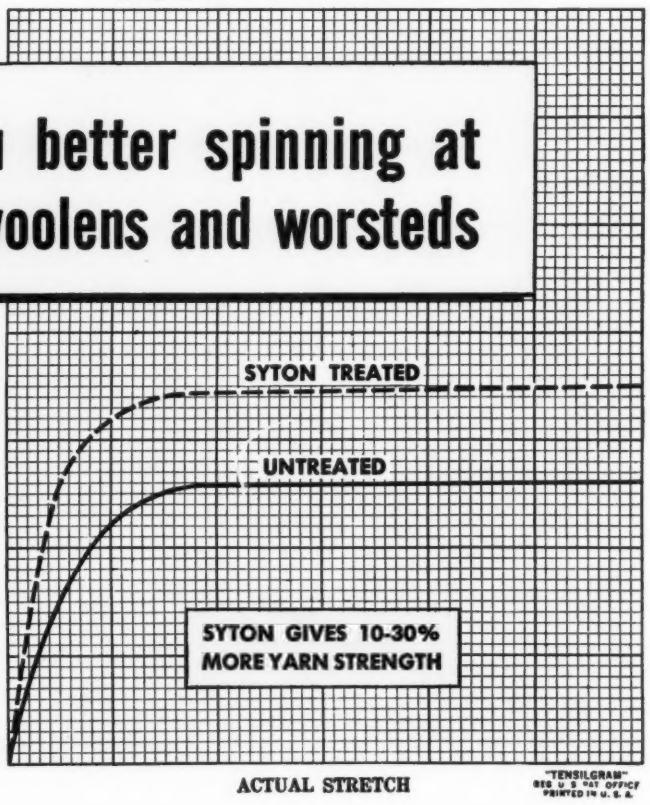
SYTON gives you better spinning at LOWER COST with woolens and worsteds

Laboratory tests and actual field experience show Syton gives 10-30% more yarn strength in woolen and worsted spinning


SYTON TREATED
UNTREATED
SYTON GIVES 10-30% MORE YARN STRENGTH
ACTUAL STRETCH
"TENSILGRAM" REG U S PAT OFFICE PRINTED IN U. S. A.

This added yarn strength means:

FASTER PRODUCTION: Because of increased yarn strength, the amount of twist can be reduced and production speeded.

LOFTIER YARNS: Less twist means loftier yarns, with tensile strength equal to or better than the strength of untreated yarns of higher twist.

HIGHER COUNTS: Closer to limit spin—for most grades of stock can be attained with Syton-treated yarns.

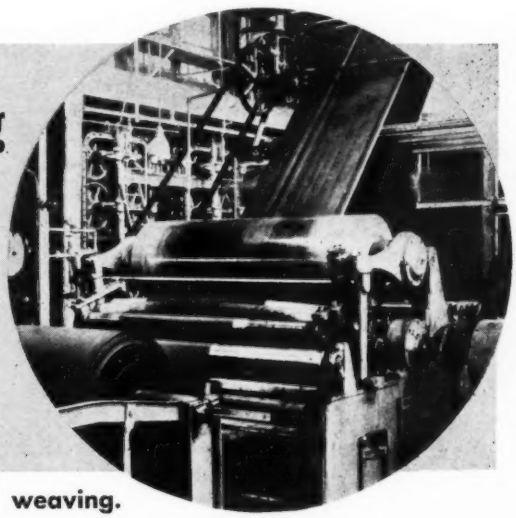
FEWER ENDS DOWN: Reductions vary from 25% to 50% depending on the grade of wool.

BETTER SPINNING EFFICIENCY: Syton produces more uniform yarn with less beard and thin spots, reduced fly waste, and better drafting.

WHAT SYTON IS:

Syton is a colloidal dispersion in water of submicroscopic silica particles which are deposited on the fibers, increasing fiber friction. The improved fiber "drag" increases yarn strength, results in better, more uniform draft control.

Get faster... easier weaving ... better fabrics with STYMER Acetate Size



Speeds operations, cuts costs in finishing and weaving.

Stymer is Monsanto's new synthetic sizing agent. Used in acetate slashing, it makes easier weaving in the loom. And it gives warp a superior finish over a wide range of humidities and temperatures.

1. Stymer forms a strong, tough, smooth and flexible film.
2. It is easily applied in a uniform coating on the individual yarn.
3. It adheres well to the fiber.
4. It is easily scoured from the woven fabric in warm water containing a mild detergent.
5. Stymer reduces static electricity.

IN SLASHING, Stymer does not stick to uncovered dry cans, stops static electricity, separates easily at the lease rods, does not gel in the pipes or size box.

IN WEAVING, Stymer-sized warps show little or no shedding, maintain yarn twist, have fewer end breaks and produce a more uniform fabric.

Stymer has high electrical conductivity—at least 400 times that of other sizes. When Stymer is used, static eliminators are unnecessary.

For further information about either Stymer or Syton clip the handy coupon below.

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The Case for Calgon* in your plant

VIRTUALLY every textile processing plant in the country benefits today from the introduction of Calgon in 1933.

Even if you do not use Calgon in your plant, you benefit from the pioneer work of Calgon research chemists. These chemists made fundamental studies of the water problems of textile plants. They developed the complex phosphate, Calgon, as the answer to many of these problems, and they worked out suitable methods of using Calgon in various processes. Their work is so much a part of the industry that their procedures are followed even when substitute products are employed.

If you do use Calgon, you have the assurance that you are using the best product available. No other complex phosphate matches Calgon's combination of useful properties, effectiveness and freedom from impurities. Calgon specifications as to purity are exceptionally high, for Calgon chemists know how these possible impurities may react with your dyes and with other chemicals used in textile processing.

Furthermore—Calgon, Inc. carries on a *continuing* program of fundamental and applied research. Calgon chemists are constantly developing new uses and improving the technique of existing applications. Your plant can profit by their work, and by Calgon quality—but the only way to be sure of these benefits is to *specify* Calgon, *and make sure that you get it.*

Some Calgon Applications in the Textile Industry!

Water softening
Control of iron in dyeing and bleaching processes
Cost reduction in peroxide bleaching
Prevention of rancid odors in wool
Elimination of lime soap film or scum
Assisting in leveling and penetration of dyes
Reducing crocking of dyed fabrics
Dispersion of pigments
Stabilizing emulsions

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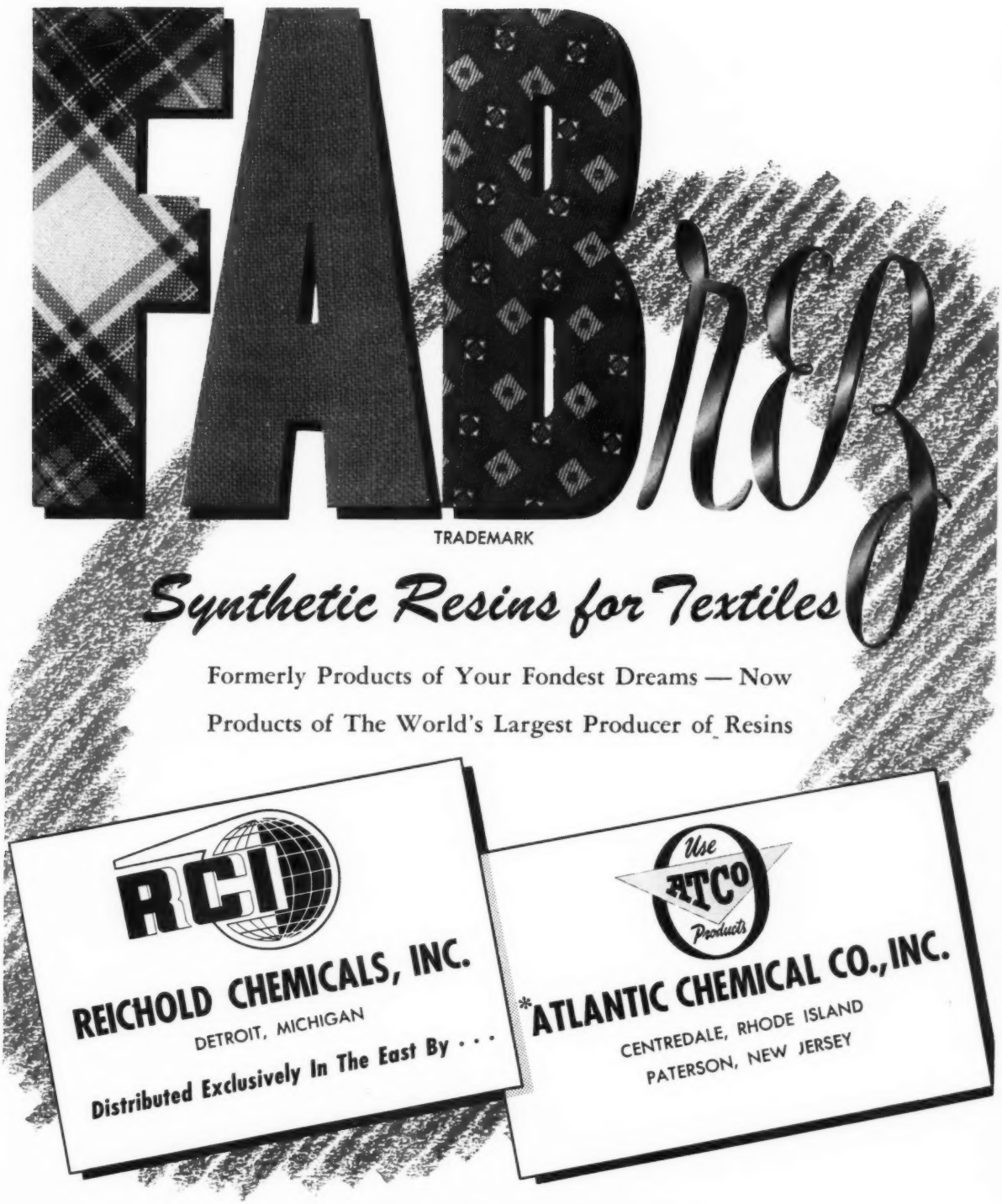


*Complete Fabrez Technical Information On Request

IT TAKES GOOD YARNS . . . TO PRODUCE GOOD WOOLENS!

Good oil, applied at the right spots, can make your automobile run smoothly, efficiently, and economically. By the same token, a good wool oil, properly applied, can give you smooth, efficient, economical performance in your carding and spinning...safety in your scouring and dyeing.

PROXOL, Procter & Gamble's efficient new wool oil, will help you turn out strong, uniform yarns—the kind so essential for good, saleable fabrics. Here are 5 reasons why:

1 Proxol is self-emulsifiable.
This is true at any concentration. Proxol has a pour point of less than 20°F . . . easily emulsifiable in either cold or warm water. Requires no added emulsifiers.

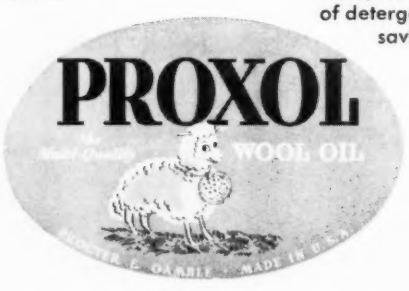
2 Proxol emulsions have small particle size.
The extremely small particle size of Proxol emulsions means quick, even spreading and thorough penetration.

3 Proxol assures efficient carding.
Card ropings are smooth and uniform. Proxol is anti-static, non-corrosive . . . consistently produces less than normal waste. Does not gum up card clothing. Stripping is reduced.

4 Proxol provides exceptional lubrication.
Fiber breakage is held to a minimum . . . fewer ends down in spinning. You get more production, improved yarns, better fabrics with Proxol.

5 Proxol scours easily.
Residual oil after scouring is extremely low, assuring uniform dyeing and finishing. Furthermore, 40% to 75% reductions in the amount of detergents normally used make substantial savings possible.

You'll revise all your previous ideas about wool oil performance when you try Proxol. Right now is the ideal time to prove this to your own satisfaction.



Procter & Gamble
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the universal low titer
textile soap

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IT'S BETTER

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modern in every feature

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Instantly reversible, one-motion clutch control, hand operated from any examining position.

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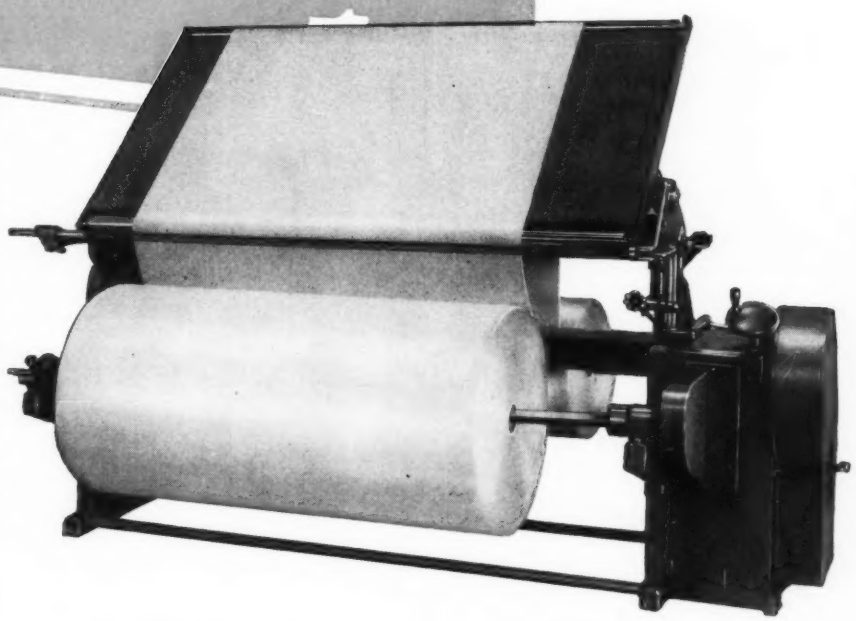
Any fabric can be examined face or back because take-ups operate clockwise or counter-clockwise.

Center-bar quills ball-bearing mounted . . . opposite end equipped with new, Van Vlaanderen positive center-bar lock.



This new, superior examining machine will handle rolls of any fabric up to 36" in diameter. Examining board is 36" high in 60" or 72" widths. Special widths available. Machine equipped with precision clock measuring yards and eighths. Attachment available for running tube to tube or shell to tube. Ball bearings throughout...sealed for life. Completely enclosed drive. Oversize disk clutches. Hard chrome-plated guide rolls.

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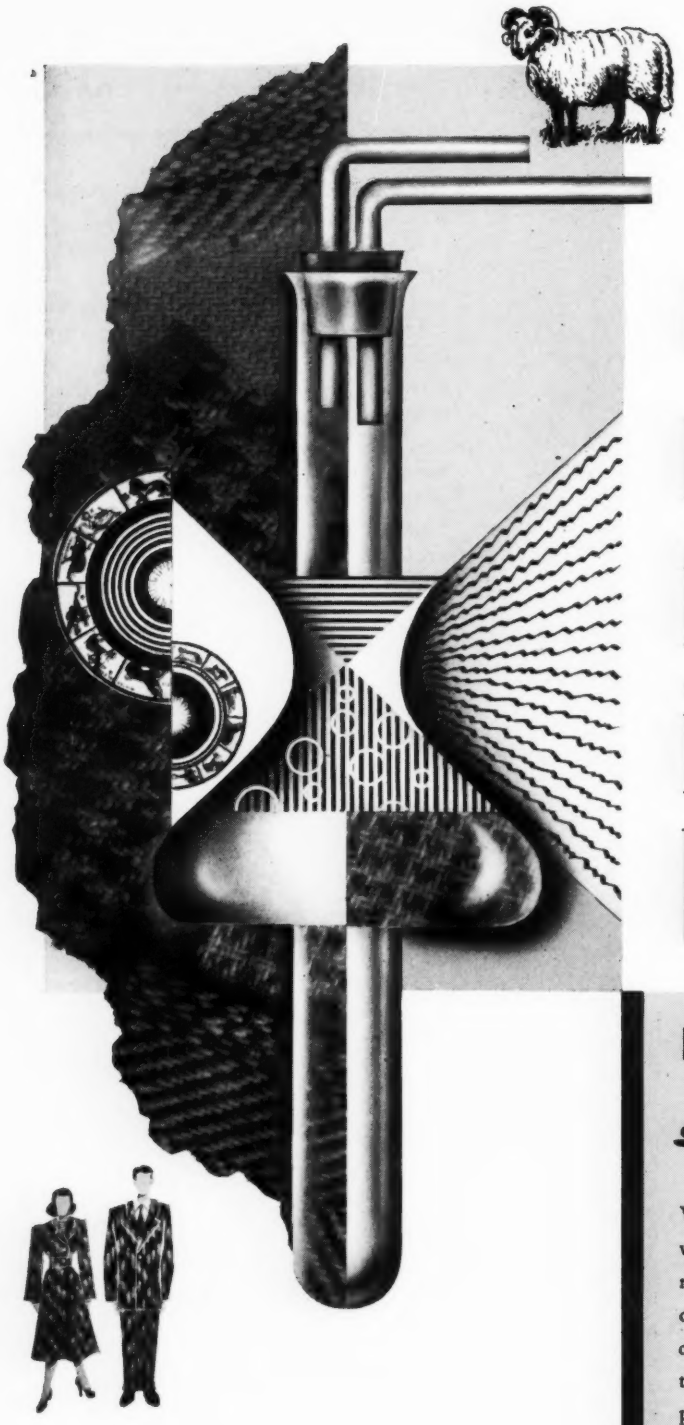

a new fabric is born

BUT...

How Will it Scour?

With a yard of your fabric in the grease we are in a position through our research laboratory to give you a complete detergency analysis. Join our many customers who are enjoying this service that offers you the most economical procedure for scouring your fabrics.

A Watson-Park representative will be glad to discuss your problems with you, or if you wish, just mail us the material you desire analyzed.

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261 FRANKLIN ST. BOSTON, MASS.
FACTORY · LOWELL JUNCTION · MASS.

SULFRAMIN* E

Excellent detergency

Maximum hard water protection

Amazing low cost!

You, who are always on the alert for better products at lower costs, will really appreciate Sulframin E Liquid. This new synthetic, organic detergent offers you superior detergency—especially on cellulose fibres—together with amazing resistance to hard water and lime soap.

Sulframin E Liquid also offers you unusual wetting and penetrating powers—even in the presence of hard water, acids or alkalis.

Your cost, based on the percentage of active organic material, is extremely low. Moreover, Sulframin E Liquid reaches you ready to use, thus saving both your time and labor.

Your copy of our Sulframin E Liquid catalog will be forwarded promptly on request. Write for it.

Available in drums, tanktrucks and tankcars.

Distributors' Inquiries Invited

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IN CANADA: Delta Chemical Works Corp., Brantford, Ont.

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Announcing

A New Product for DYERS and PRINTERS

LOMAR PW the new dispersing agent developed by Jacques Wolf & Co., assures more efficient and economical processing.

• *In Dyeing*

Level shades and uniform absorption of dyestuffs by the fibres, depend largely upon an even dispersion of colors in the dyebath. The addition of a small amount of LOMAR PW in pasting up indanthrenes or acetates solves this problem.

• *In Printing*

When added to the printing paste, LOMAR gives finer particle suspension, improved flow and smoother consistency. By keeping the colors in suspension, LOMAR PW assures efficient, economical results.

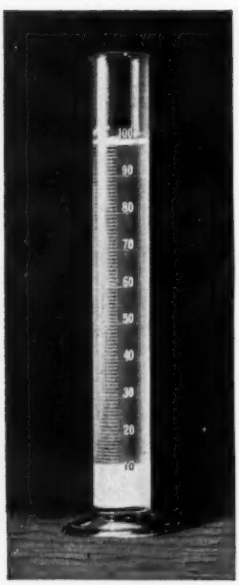
• *In Backfilling*

In backfilling, LOMAR PW is added to the heavy backfill mixture of clay and starches to give uniform suspension of the clay, good flowing properties and more uniform results on the fabric.

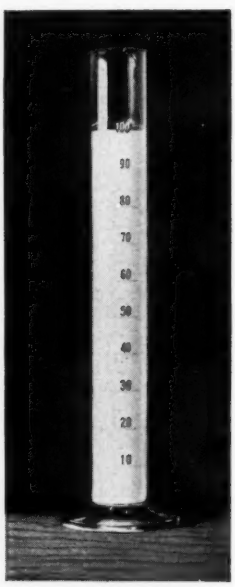
For complete information on LOMAR PW, send today for your copy of Bulletin No. 21.

TYPICAL OF THE DISPERSING ACTION OF LOMAR PW

The contents of these two graduates are identical, except for a small percentage of LOMAR PW. Note the continued even suspension and dispersion in the right hand graduate after standing ten times as long as the one at the left.



Blanc Fixe after 30 minutes — no dispersing agent



Blanc Fixe after 5 hours — plus LOMAR PW

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Warehouses: Providence, R. I.; Philadelphia, Pa.; Utica, N. Y.; Chicago, Ill.; Greenville, S. C.; Chattanooga, Knoxville, Tenn.

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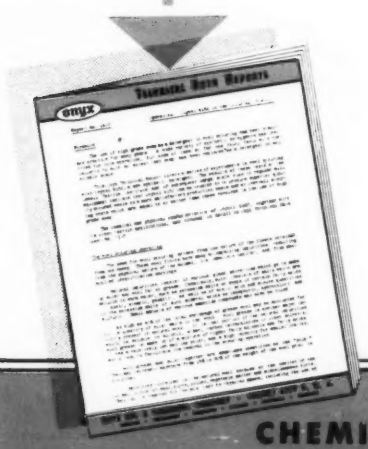

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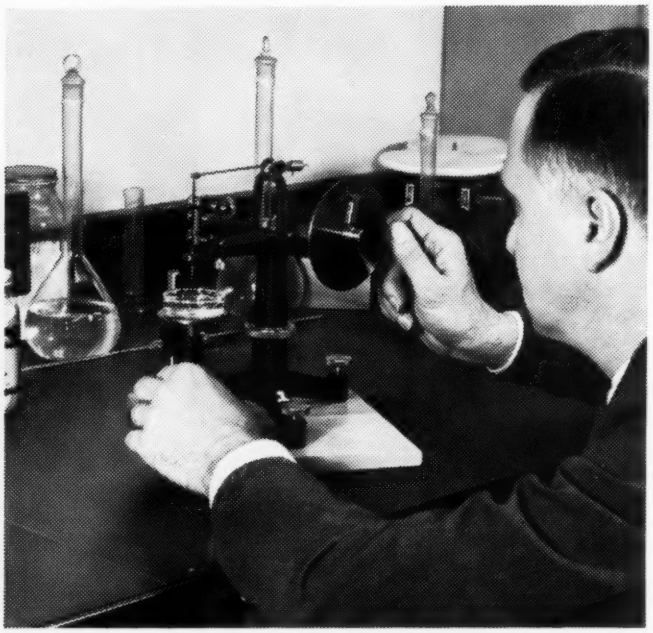

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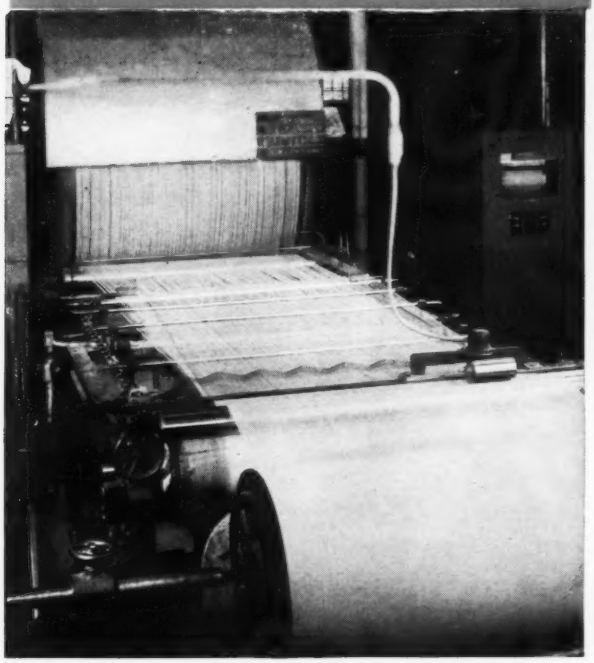

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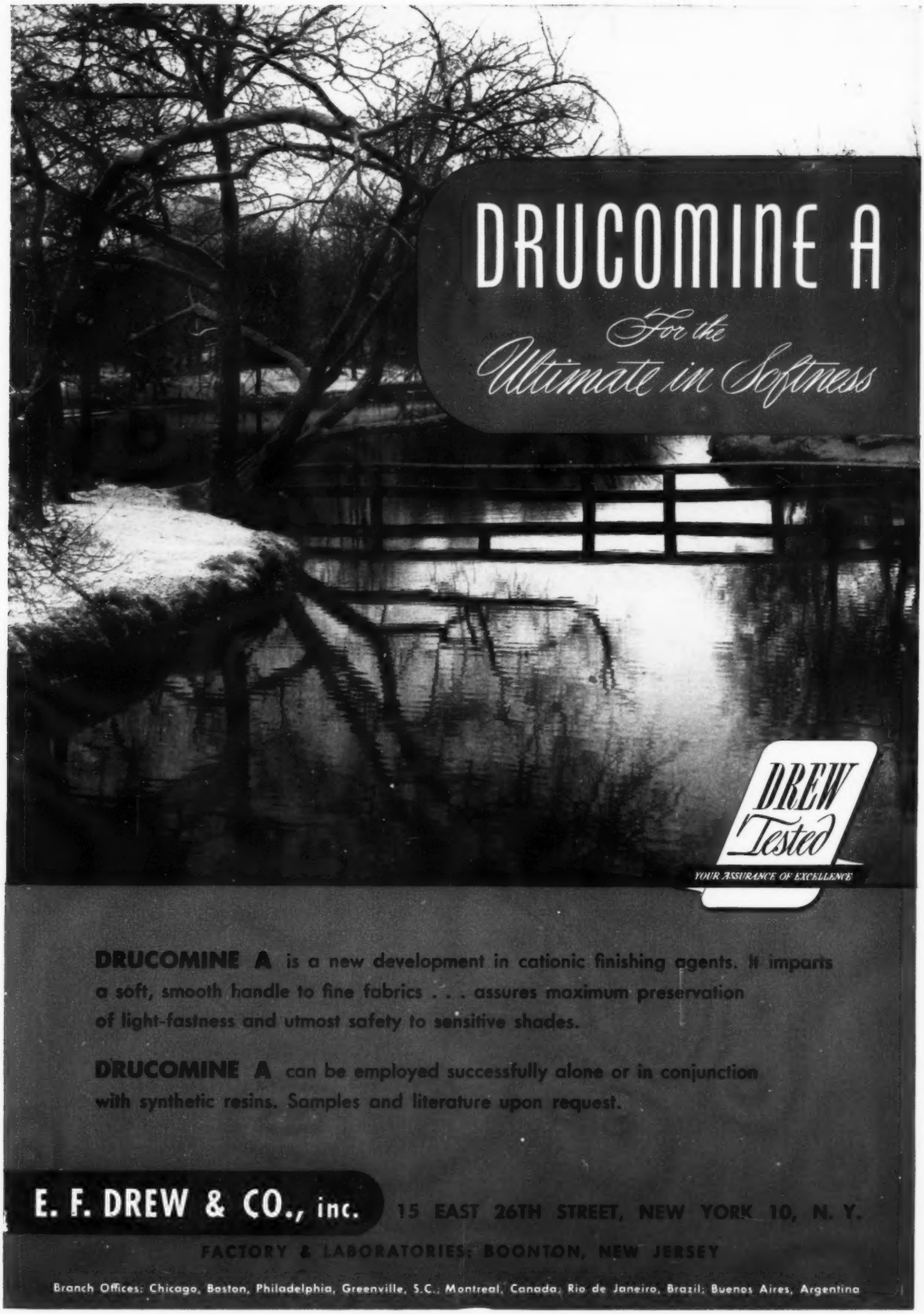

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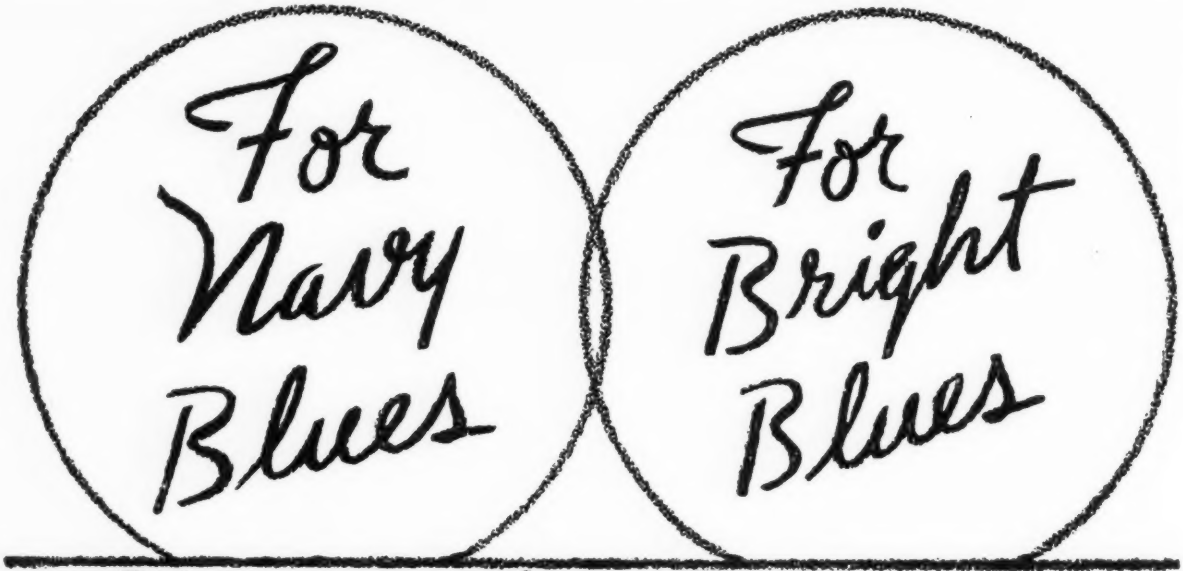

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Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

Published every other Monday by the **HOWES PUBLISHING COMPANY, INC.**, One Madison Avenue, New York 10, N. Y. **C. R. Howes**, Chairman of the Board; **Louis A. Olney**, President; **Harry F. Crawford**, Executive Vice-President; **L. R. Keeffe**, Vice-President; **Ernest J. Finan**, Treasurer; **Norman A. Johnson**, Secretary; **C. Essenbreis**, Assistant Secretary

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FEBRUARY 21, 1949
VOLUME 38 NUMBER 4

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VOLUME 38 FEBRUARY 21, 1949 NUMBER 4

THE ACTION OF LIGHT ON TEXTILE MATERIALS

A Review of the Literature

DOROTHY K. APPLEBY

Southern Regional Research Laboratory[1]
New Orleans, Louisiana

Of the numerous factors which comprise weather, sunlight is generally conceded to be the most active in causing deterioration of exposed textiles. Some data on the general subject of weathering, particularly the sunlight aspect, were published in the late 19th and early 20th centuries. The most intensive studies, however, have taken place since the advent of the airplane when the photochemical effects on textiles used in its construction presented a safety as well as an economic problem.

Although photochemical action produces both physical and chemical changes, the action of light on textiles appears to be primarily of a chemical nature. It would seem, therefore, that actinic degradation —that is, degradation through the chemical effect of radiant energy—could be reduced or even eliminated by treatments capable of inhibiting or preventing the photochemical action. Before successful treatments can be found to do this, an understanding of actinism on textiles is necessary. Such information is also a prerequisite in determining the most expedient method for testing treatments intended to provide protection. Only after the mastery of these preliminary aspects can the prevention of photochemical deterioration of textiles be effectively accomplished.

The purpose of this paper is to report the findings recorded since 1920[2] on the action of light on the various textiles. The discrepancies in some of the findings are probably due to varying conditions of exposure and textile samples—variables which are shown to affect the action of light. The controlled conditions necessary for the most dependable results were, in many cases, not considered or not reported in the literature. In the absence of necessary minutiae of pre-exposure, exposure, and post-exposure data, therefore, statements or comparisons cannot be made with absolute surety.

Radiation

For research into the effect of sunlight on textiles, the most desirable radiation would be the natural one. The unpredictability and daily time limit of sunlight, however, do not afford sufficient uniformity or acceleration for practical laboratory investigations. As a substitute, a predictable and controllable radiation, similar to solar radiation in spectral range, distribution, and intensity would be ideal. Cunliffe and Farrow *(57)* recognized that for textile reactions dependent upon mechanical form of the sample, natural and artificial light sources would be comparable; but that for reactions dependent upon chemical nature of the sample, it might be unsafe to predict the behavior of textiles under sunlight on the basis of exposures of the same textiles under artificial light.

The above workers reported, however, that of available artificial sources the carbon arc appeared to give the most dependable results. Appel and Jessup *(15)* also reported the usability of the carbon arc as a substitute for sunlight in obtaining results of exposure for silk fabrics. From other investigations, it also appeared that carbon arc radiation provided effects most nearly approaching those of sunlight, particularly when the high-intensity carbon arc and filters were used. The spectral range of a Corex glass-enclosed carbon arc is approximately 2,900 to 40,000 Å as compared to a range of approximately 2,900 to 30,000 Å for sunlight at sea level. Another similarity of these two sources is in the energy distribution of the individual, spectral rays. In their investigations into the usability of a carbon arc machine, Chatten and Workenthin *(48)* found undesirable conditions which they suggested could be abolished by proper modifications. Nevertheless, the carbon arc does approach the ideal as a substitute for natural light without the disadvantage of the time limit of sunlight and is capable of giving controllable radiation. (See Figures 1 and 2.)

A second light source used in the study of actinism is the mercury vapor lamp. Its spectral range is only 1,800 to 14,000 Å with an especially strong distribution in the ultraviolet range. (See Figures 3 and 4.) Using a clear glass screen which absorbs rays less than 3,100 Å, Glendinning and Ramsbottom *(74)* found that the destructive effect of a mercury arc was almost zero, whereas the destructive effect of a mercury arc was almost zero, whereas the destructive effect of sunlight was practically unchanged. The radiation is not predictable because it tends to change in quality and intensity with continued use of the lamp. Another disadvantageous feature is the production of ozone which might cause inaccurate results *(39, 67, 228)*. But a point in favor of the mercury

[1] One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.
[2] This study was concluded in April, 1948.

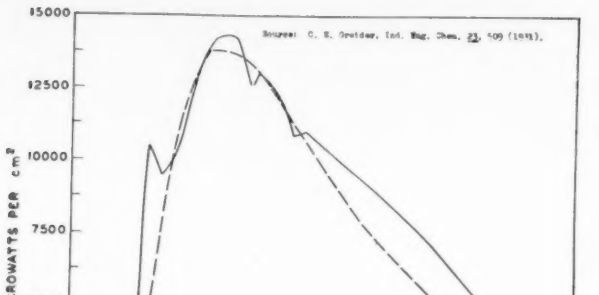

Figure 1. Natural Sunlight at the Earth's Surface (broken line) and the High-Intensity Carbon Arc.

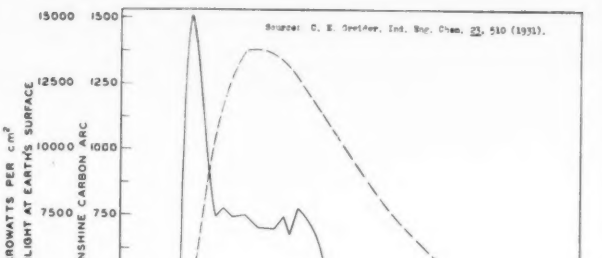

Figure 2. Natural Sunlight at Earth's Surface (broken line) and the Sunshine Carbon Arc.

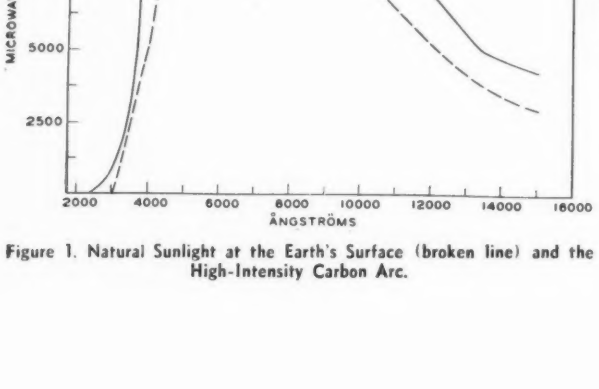

Figure 3. Natural Sunlight at Earth's Surface (broken line) and the Quartz-Mercury Vapor Arc.

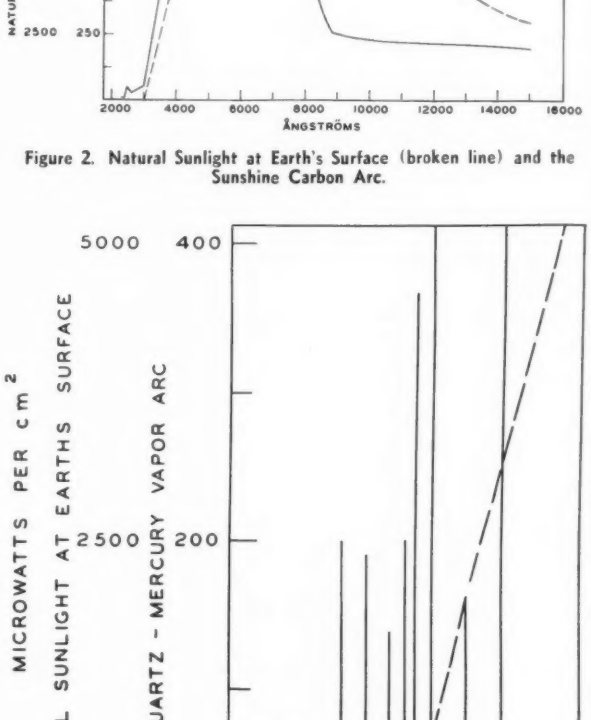

Figure 4. Enlarged View of Section in Figure 3.

lamp is the unusually high light intensity which it provides for accelerating the breakdown of the exposed fabrics. This more rapid deterioration undoubtedly facilitates the study of photochemical action. However, this same intensity might also cause changes of the textiles which would not be indicative of similar changes under natural exposures. Although Egerton *(64)* noted some qualitative similarities in the effects of irradiation by the mercury lamp and by sunlight, he did not consider the mercury lamp to be a satisfactory substitute for sunlight. In experiments by Barr *(22)* and Eichler *(65)*, the quartz mercury vapor lamp did not give results in good agreement with those obtained from exposures to sunlight; and, Trotman *(199)* found dissimilarities on comparing results of irradiations of silk under the mercury vapor lamp and under the carbon arc.

The G.E. S-1 sunlamp, a third source of radiation, has been used less extensively than the carbon arc and the mercury vapor lamp. An impracticality of the sunlamp for investigating actinism is its low output of light. The small amount of obtainable radiation necessitates prolonged exposures for the production of photochemical changes.

If it is absorbed and sufficiently active, Jones *(109)* suggested that light of any wave length can produce degradation of the irradiated samples. From the results of research by Turner *(201)*, it was concluded that visible light has little, if any, destructive effect but that the shorter rays apparently have an extreme degrading power. Other investigations into the chemical activity of the individual bands of the spectrum, whether natural or arti-

ficial light, have shown the ultraviolet rays to be the most degrading to untreated textiles. As remarked by Jones, however, these findings should be interpreted in a negative sense, that is, the ultraviolet rays are damaging because they are absorbed, whereas the longer wave lengths are not absorbed and so have no effect. In this connection, some mention of the sensitizing dyestuffs should be made. Egerton *(64)*, noting that some dyed fabrics were more rapidly degraded than similar but undyed fabrics, believed that the dyestuffs absorbed light energy from the visible region of the spectrum and that this energy activated the photolysis. The above investigator compared this reaction to one occurring in photographic plates which display selective light absorption due to the presence of appropriate organic compounds. Landolt *(118)* attributed the photo-catalytic action of the dyes to absorption of the chemically active blue violet and ultraviolet rays, but Henk *(95)* suggested that the dyes had the property of "converting long rays into short rays". Atkinson *(17)* proposed that a region of light activity exists in the infrared range, but this is still to be investigated. As far back as 1883, however, Witz *(22)* noted a maximum activity of light in the visible violet and invisible near-ultraviolet; since that time, other investigators have further restricted the upper limit of maximum activity. Experiments by Glendinning and Ramsbottom *(74)* established the most destructive band of sunlight as being 3,900 to 3,100 Å; Aston *(201)* reported that the most deteriorating rays for linen were below 3,660 Å; Brown *(38)*, for cellulose in general, below 3,600 Å; Bruner and Goehring *(39)*, for silk, below 3,490 Å. Oguri and Takei *(144)* reported that their experiments on cellulose showed the rays below 3,640 Å as the most effective and that the short ultraviolet rays played an important part in the effect. An interesting observation concerning the optimum wave length to enhance the chemical bleaching of wood pulp was made by Hirschkind, Pye, and Thompson *(104)*. These investigators found that lignin, the colored encrusting matter in pulp, absorbed and was activated by wave lengths below 3,850 Å but that the relatively stable cellulose molecule required the higher energy of the farther ultraviolet for activation. This latter limit was found below approximately 3,500 Å. Hirschkind and his co-workers thereupon suggested a range of 3,500-3,850 Å as one which would activate selectively and should remove the coloring matter without degrading the pulp *(105)*. These figures, it is seen, are consistently within the ultraviolet range. The varying limits given for the activation of the different textiles could be due to deviations in the filters used to exclude all but the ultraviolet rays or, as will be shown later, to actual differences in the properties of the textiles.

Another phenomenon noted by Pech *(149)* and by Campbell and Fynn *(44)* appears to be an opposing action among spectral bands. Fynn, Sands, and Campbell[3] observed this while studying the deterioration of cotton exposed to total and to filtered sunlight. The resultant breaking strength losses showed that in one case the damage caused by total sunlight was less than the damage caused by an individual band. Upon limiting the carbon arc radiation to the range of solar radiation, the damage caused by the bounded spectrum was less than that caused by the ultraviolet region of the complete spectrum. In their study of the mercury vapor lamp, Oguri and Takei *(144)* also found that the damage caused by total radiation was less than the total damages caused by the individual bands. According to Wagner, Webber, and Siu *(218)*, exposure to the 3,700-3,600 Å region of the mercury arc resulted in as great a degradation as exposure to the entire spectrum of the mercury arc. With the S-1 sunlamp, however, Bruner and Goehring *(39)* found that exposure to the entire spectrum resulted in a greater damage than exposure to any one part of the spectrum.

It is known that the greater the amount of active ultraviolet incident on the sample, the greater the photochemical damage. A greater deterioration found by Whittaker *(226)* when fabrics were exposed to sunlight behind blue glass than when exposed behind ordinary window glass is probably explainable by the fact that, in addition to passing more of the ultraviolet, the blue filter passes little of the longer wave lengths which oppose the action of ultraviolet. Grimes *(82)* found less damage to cotton exposed at sea level than to that exposed at the higher altitudes and attributed this difference to the smaller amount of ultraviolet penetrating the atmosphere at sea level.

Widely used artificial sources of radiation, namely, the unfiltered carbon arc and the mercury vapor lamp, by means of the extreme ultraviolet activity, accelerate photochemical degradation. However, this same ultraviolet activity could produce significant changes which would not be applicable in predicting the effect of sunlight. By filtering carbon arc radiations, and thereby decreasing the effect of shorter ultraviolet, results of natural exposure were more closely reproduced. The evidence of these and other investigations appears to indicate that the artificial sources described here cannot be positively used as a basis for predicting the degradation of textiles exposed to actual sunlight.

[3] Textile Research J. 350-357, June, 1948.

The Role of Oxygen

In the action of sunlight on textiles, conditions of exposure as well as the quality and intensity of radiation have been found to accelerate or to decelerate the photochemical action. It is possible that these conditions, particularly in extremes, produce effects other than changes in the rate of degradation.

Of the exposure conditions, i.e., composition of the atmosphere, temperature, moisture content, and air currents, the presence or absence of oxygen appears to be the most important in determining the effect of light. As pointed out by Egerton *(64)*, there is little doubt that under normal conditions of use, oxygen plays an important part in the photochemical degradation of textiles. In fact, Jones *(109)* explained actinism as "a pronounced acceleration of a normally very slow process of oxidation of cellulose to oxycellulose and carbon dioxide by air . . . or other source of oxygen . . . and water". Nonetheless, to understand the singular action of light, it is well to observe this action in the absence of oxygen. When atmospheric oxygen was not present, the Royal Aircraft Establishment *(164)* and others *(25, 122, 155)* found only a negligible reaction. Since actinism was thought to be an oxidation reaction, adsorbed oxygen on the fiber was presumed to induce the negligible weakening. Heuser *(100)* pointed out, however, that if oxygen were necessary for the reaction, the effect of light would discontinue as the limited supply of adsorbed oxygen was utilized, and the experiments did not show a termination of the action. Stillings and Van Nostrand *(196)* upon irradiating cellulose in nitrogen found a greater degradation than was explainable by the presence of adsorbed oxygen. Heuser and Chamberlain *(101)* upon irradiating cellulose in helium obtained the same results as the above investigators. Although they confirmed the findings that the presence of oxygen would increase the rate of degradation by light, Heuser and Chamberlain, Stillings and Van Nostrand did not regard it as a vital condition. These workers placed special emphasis on complete removal of oxygen while exposing cellulose to strong ultraviolet radiation for a prolonged period of time; this exposure of cellulose resulted in decreases of degree of polymerization and of alpha cellulose content and an increase in copper number. Oguri and Yamaguchi *(146, 147)* found that a reaction occurred in the absence of oxygen and that the presence of oxygen accelerated and complicated this reaction by introducing an oxidation process. The experimental results of Steurer and Mertens *(194)* were in agreement with the

above findings; these investigators concluded that the degradation taking place in the absence of oxygen is a true photolysis and in the presence of oxygen, a photooxidation superimposed on the photolysis. Contradictory statements concerning the role of oxygen become reconcilable, however, when the possibility of more than one photochemical reaction is considered. Kauffman *(110)* and others *(1, 90, 200)* reported two successive stages of reaction to light, the first not involving oxygen and the second involving oxygen.

Ramsbottom *(155)* experimented with sealed exposure tubes and found that the pressure of the moist oxygen in the system was lessened with an extended irradiation period and attributed this to absorption of the oxygen by the sample being irradiated. Bot and Vreeswijk *(32)* observed that, on storing textiles in the dark, there was no absorption of oxygen. But in the presence of light, they noted an absorption of oxygen to an increasing degree by cotton, linen, hemp, and jute, in that order—jute was also the most sensitive to photochemical degradation.

Oxygen is necessary for the additional degradation which can be expected to occur after removal of the light source. This post-exposure effect is noted only when samples have been exposed for a short time in the atmosphere or in oxygen. Heuser and Chamberlain *(101)* and Van Nostrand *(206)* suggested that the action of light on cotton was to break the molecular chain into shorter units and to weaken the glycosidic linkages so that they were more readily attacked and ruptured by oxygen. This theory appears to be supported by Van Nostrand's study of the post-exposure action in which he observed: (1) After a period of storage in oxygen, the post-exposure actions came to a standstill, indicating that the weakened linkages had all been oxidized and (2) storage in an oxygen-free atmosphere could prevent or terminate the post-exposure action. Stillings and Van Nostrand *(196)* found that the post-exposure sensitivity to air or oxygen of cotton and cellulose was enhanced with an increase in storage temperature. Cormany *(54)* reported that silk alternately irradiated and stored showed more yellowing than silk irradiated without interruption and attributed the greater yellowing of the former sample to the action of oxygen during storage. Egerton *(64)* suggested that unless the temperature and relative humidity during irradiation were the same as those encountered during storage, the post-irradiation effect could be misinterpreted.

The proven activity of ozone in causing deterioration and the ability of light to produce ozone from oxygen have led some investigators to credit the photochemical degradation to the action of ozone *(5, 109)*. Doree and Dyer *(17)* reported similarities in the degradation products resulting from the action of light and from the action of ozone; in both cases, the affected cotton reacted positively to the tests for oxycellulose. Stillings and Van Nostrand experimented with a filter which removed the wave lengths responsible for the conversion of oxygen to its activated form, but the reaction to light was not eliminated. Earlier research by Lindemann showed that the above evidence is not conclusive. Although oxygen is usually activated by wave lengths of 1,380 Å, Lindemann found the adsorbed oxygen of linen to be activated by 3,230 Å *(55)*. This figure was based on the dielectric constant of linen, therefore it may differ for the different textiles.

Other Exposure Conditions

Although oxygen is thought to have the greatest influence on photochemical action, temperature, moisture, and air currents also modify the rate of degradation, and it is important to know the extent to which they do this. If extremes of the conditions are employed, however, they may overpower the effects of light action and produce effects not safely to be attributed to light.

Fynn and others[3] suspected some of the damage to exposed cotton was caused by high temperature (100-110° C.) created with the carbon arc. They found that upon controlling the temperature (40-50° C.), the irradiated samples were, in fact, less damaged. In these experiments, the concurrent relative humidities were low. Grimes *(80, 81)* and De Puyster *(59)* also noted increased damage with an increase in temperature. And, as had been noted by Stillings and Van Nostrand (see "Role of Oxygen"), the higher the temperature, the greater the post-exposure effect. Although Tweedie *(204)* found that an increased temperature in the carbon arc lamp would result in an increased degradation of exposed silk, the apposite relative humidity change which accompanies the temperature change was not considered.

Harris *(88)*, Heuser *(100)*, and Wagner and others *(218)* did not consider moisture to be essential for photochemical degradation; but Harris, Cormany *(54)*, Egerton *(64)*, and others *(74, 155)* reported that when moisture was present, degradation was accelerated. From investigations of actinism on wool, Harris and Smith *(90)* suggested that water was not essential but was catalytic to the decomposition process. Sommer *(189)* observed that this catalytic nature of water was particularly active in the cases of wool and bast fibers. After irradiating wet and dry cellulose, Oguri *(143)* found that the wet-exposed sample showed a greater increase in reducing properties (copper number) than the dry-exposed sample; further experiments by this worker indicated that less than 20 percent absorbed water had no influence on tendering. Oguri further noted that the influence of water on photolysis gradually decreased and became constant with increasing oxygen in the exposure medium. Egerton *(64)* reported less effect of moisture in oxygen than in pure air. Bone *(28)* observed that cellulose was degraded by the sole action of water evaporation and that this action was more pronounced in the presence of light. A post-exposure effect of humidity was noted by Turner *(201)*; with an increased humidity cellulose which had been insolated suffered a further loss in strength in contradistinction to unexposed cellulose which sustained a gain in strength.

Whittaker *(226)* and Bot and Vreeswijk *(32)* noted an increased degradation when air was circulated over the samples during irradiation. Whittaker further found that fabrics mounted on open-back frames were more readily degraded than those mounted on boards or closed-back frames. If artificial light sources are used, additional factors of exposure should be noted, namely, the distance between light source and sample and the presence of possible reflecting surfaces which would increase the amount of incident light. Campbell and Fynn *(44)* observed that unless samples irradiated by carbon arc were backed with an opaque material, the reflected light caused considerable deterioration. Race and others *(152)* in working with wool preferred open exposures rather than exposures behind glass filters, because unfiltered radiation resulted in greater damage while permitting also the removal of degradation products through the action of rain thus exposing the fiber cores to further damage. Basing his statement on hours of sunshine, Von Bergen *(212)* reported that to achieve the same effect as direct exposure, exposure under glass must be prolonged four to six times.

In studying photochemical action, the undesirable condition of atmospheric acidity should be considered. Cunliffe and Farrow *(57)* on adding small amounts of alkali and of acid to the exposure atmosphere observed increases in the degradation of cotton, especially in the case of the acid which even affected the unexposed control. As mentioned by De Puyster *(59)*, Jones *(109)*, and Barr *(22)*, the effects of atmospheric acidity could lead to misjudgment of actinism.

Physical Properties of Samples

The actual effect of photochemical action on textiles depends upon the extent to which the damaging light incident on

the fabric is absorbed by the fabric. In an anonymous literature review of actinism on cotton *(1)*, it was stated that "the light sensitivity of a fiber is largely conditioned by the capacity of the fiber to absorb light rays". This observation was substantiated by several investigators who showed that textiles which were lustrous and reflected light were more resistant to actinic degradation than textiles of similar construction which were dull and absorbed light. For example, bright nylon was more resistant than dull nylon *(33, 185)*; mercerized cotton was more resistant than untreated cotton *(94, 186)* and the most lustrous cotton, Egyptian, more resistant than other cottons *(179)*.

The construction of yarn and of fabric determines the amount of incident light absorbed per unit volume. Grimes *(80)* investigated the effect of the physical structure of the yarns and fabric on its susceptibility to light degradation. She estimated that one-fourth of the breaking strength losses of irradiated fabrics could be attributed to the physical constructions such as yarn twist, take-up, ply, weave of fabric. Whittaker *(226)* found that a decrease in yarn size led to an increase in degradation but that yarns of the same size made up different sizes of fiber showed little difference in degradation; Cunliffe and Farrow *(57)* noted that the fibers in the yarns were tendered to the same extent as the yarns. Grimes and Cunliffe and Farrow reported that a decrease in yarn twist also resulted in an increase in degradation. Grimes found that plied yarns were not as resistant as singles and from exposures made with the carbon arc, Cunliffe and Farrow corroborated the greater resistance of the singles, both gray and bleached cottons. These workers obtained slightly different results in sunlight exposures in which the bleached singles were more resistant than the bleached plied, but the unbleached plied were more resistant than the unbleached singles. It is generally agreed that the heavier, more closely woven fabrics are the least deteriorated by light. Turner *(22)* after exposing 2-ounce and 10-ounce ducks reported over a 50 percent breaking strength loss for the light and only a 15 percent breaking strength loss for the heavy fabrics. Whittaker *(226)* found net constructions to be degraded at about six times the rate of closely woven repp.

It is not within the scope of this paper to discuss the accidental or intentional addition of foreign materials to textiles. It should be noted, however, that photochemical action is accelerated or decelerated by certain dyestuffs, sizing, weighting, other specialized finishing materials, traces of acids, alkalis, salts, soaps, and oils.

Résumé

From the various investigations of actinism on textiles, the following appeared as factors to be considered, controlled, and reported for maximum certainty and reproducibility of findings:

(1) Character and intensity of light

(2) Atmospheric conditions, i.e. content, temperature, moisture, air currents

(3) Manner of mounting sample to be irradiated

(4) Complete specifications of yarn and/or fabric

(5) Knowledge of sample pre-history.

Evidence of Actinism

Irradiation of textiles changes both their physical and chemical properties, in a manner usually characteristic of the particular fiber being exposed. Because of the distinctive reactions, each textile will be discussed separately. The natural fibers will be first considered and will be followed by the manufactured fibers.

Natural Fibers

I. Cotton

Cotton has been the most widely investigated textile. Even so, knowledge of actinism on cotton is still in the theoretical stages. De Buccar *(58)* and Henk *(97)* upon noting an increase in strength and decreases in copper number and solubility in the usual cellulose solvents of irradiated cotton after a short period of exposure proposed the occurrence of an initial polymerization. (This phenomenon led to the application for U. S. Patent 1,948,276 *(148)* which suggested the strengthening of cotton by rigidly controlled exposure to light.) This incipient gain in strength was rapidly followed by the formation of an alkali insoluble cellulose and an accompanying loss in weight due to the splitting off of carbon dioxide and water *(1)*. Egerton *(64)* observed the same development of carbon dioxide and water, and others *(25, 172)* carbon dioxide only; Stillings *(195)* reported the formation of carbon monoxide as well as carbon dioxide. Following the alkali insoluble cellulose, the alkali-soluble oxycellulose with reducing groups was produced. Witz and Doree and Dyer *(59)* reported that oxycellulose was the end product of photochemical action on cotton. Although Girard *(55)* suggested the formation of hydrocellulose as the product of general weathering, tests on the product of irradiation indicated an oxidized cellulose *(25, 64)*, and this product is more widely accepted. In fact, Haller *(85)* found similarities in the effects produced by oxidizing agents and by the action of light excepting that actinism was less far-reaching.

Various criteria have been used in studying the character of irradiated cotton. The most common of these were breaking strength, fluidity or viscosity, copper number, and methylene blue absorption. In addition, Haller *(85)* used techniques of differential dyeing and microscopic examination. With respect to the first of these criteria, Stillings and Van Nostrand *(196)* and Wagner and others *(218)* have suggested that the loss in strength is a result of a breaking down of the chains of cellulose molecules into smaller and smaller fragments thus causing the cellulose to lose one of its most essential properties for strength. By studying the crystal structure of methylcellulose, Steurer *(193)* noted that exposure to ultraviolet caused ruptures of the oxygen bridges in the molecular chain. Cunliffe and Farrow *(57)* reported that irradiated cotton fibers, yarns, and cloth lost strength at a constant rate until a 40% breaking strength loss was reached, but that at this point the rate of strength loss decreased. It was assumed that to a certain extent the degradation products of the cellulose walls protected the fiber cores. Microscopic examinations by Doree and Dyer *(55)* revealed that the damaged cotton fibers were fractured and swollen. Williams *(228)* found that cottons which had been deteriorated by exposure to ultraviolet light lost much of their remaining strength when wet. Whittaker *(226)* followed the irradiating of cotton with a soap and water bath and noted an increase in degradation. Egerton *(64)* observed that if cotton were in an alkaline condition before exposure, it would suffer greater degradation during exposure.

Grimes *(82)* remarked the photochemical action on open cotton bolls while still in the field, effecting a darkening, less creamy appearance of the fibers, a strength loss, and shortening of the staple. Over an average of 6 weeks of exposure, the cotton had dropped 2 grades in salable quality; after 25 weeks, the cotton had dropped 5 grades.

Grimes *(80)* also found a color change occurring to exposed fabrics, gray and bleached. In this series of outdoor experiments, Grimes did not allow the samples to become saturated with rain. The gray materials were bleached by sunlight and the bleached materials were yellowed. Grimes has attributed this latter discoloration to the formation of oxycellulose.

Campbell and Fynn *(44)* referred to the color changes of bleached cotton under varying conditions of exposure. The effects of temperature, moisture, and wave length were considered. High temperature and the unshielded carbon arc produced excessive browning of dry samples and bleaching of wet samples. By wetting the cotton, the temperature was lowered, therefore the brownish discoloration was attributed to the high temperature since

heat alone is known to produce this effect. Low temperature and the quartz mercury vapor lamp also produced yellowing, and in this case, the discoloration was attributed to short ultraviolet, below 3,000 Å. In other experiments with the carbon arc, these workers found that uncontrolled temperature and radiation up to 5,000 Å whitened the exposed, bleached cotton, while radiation above 5,000 Å and below 3,000 Å yellowed the samples. It is possible that in total radiation the different actions of the different wave lengths will oppose each other and that, in toto, the exposure conditions, rather than the wave lengths, will determine the exposure effects. For example, Campbell and Fynn reported that exposure of bleached cotton to unfiltered carbon arc, one part of which was maintained in a dry state, the other in a saturated state, resulted in a yellowing of the dry portion and a whitening of the wet portion. It is interesting that the fluidities were identical for both the dry and the wet portions.

Fynn and others[3] observed that insolation with protection from saturation by rain produced a whitening of both gray and bleached cottons. In carbon arc exposures, they found that unfiltered radiation yellowed the dry gray and bleached samples but whitened the corresponding wet samples; and that filtered radiation whitened both gray and bleached samples, with this effect accelerated when the cottons were wet.

Doree and Dyer *(59)* and Scheurer *(22)* noted that cotton cloth, except when protected by a glass screen, was yellowed by radiations of the mercury vapor lamp.

The gray and the bleached cottons have been observed to show differences in the rate of photochemical degradation. Grimes *(80)* and Jones *(109)* in sunlight exposures, and Cunliffe and Farrow *(57)* in carbon arc and sunlight exposures, found that a bleached cotton fabric deteriorated more rapidly than did one in the gray state. In sunlight exposures, Fynn and others[3] verified these results in finding a greater fluidity rise of bleached cotton. In opposition, they found that filtered carbon arc exposures produced a greater degradation of the gray cotton as indicated by both breaking strength losses and fluidity rises. Singularly, they also later showed that when unfiltered radiations of the carbon arc and of the quartz mercury vapor lamp were used, the gray cotton showed a greater breaking strength loss but the bleached cotton a greater fluidity rise. While these findings are unexplainable, they do show that the results obtainable in carbon arc and in actual sunlight exposures are not thoroughly comparable.

There are three possible reasons for the greater rate of degradation of bleached fabrics exposed to sunlight: (1) the foreign material on the gray cotton acted as a filter to the damaging light rays, (2) bleaching of the cotton caused a weakening of the cellulosic linkages which are thereby more easily broken under the action of light, (3) a combination of the above effects.

Since loss in breaking strength is primarily a measure of the physical breakdown whereas the other indicators of actinism, namely, fluidity, copper number, methylene blue absorption, are primarily measures of chemical degradation, the two sets of values are not strictly comparable. There is the further consideration that among the measurements determining the various chemical changes, unequal results might also be obtained. The research reports of Barr and Hadfield *(25)* revealed, however, some parallelism in decreased viscosity (reciprocal of fluidity), decreased breaking strength, and increased copper number; the slightly decreased methylene blue absorption which was related to increased moisture content was a separate function.

Cuprammonium fluidities—or viscosities—appeared to give the most accurate indications of photochemical degradation and were used where facilities were available. Since these measures can be used to detect incipient chemical damage, a large rise in fluidity—or drop in viscosity—can be accompanied by little change in breaking strength. In addition to a drop in the degree of polymerization, Heuser and Chamberlain *(101)* found that exposed cellulose displayed increases in acidity (uronic acid measured as percent of carbon dioxide) and in copper number.

Increases in copper numbers and methylene blue absorptions also show modifications in the chemical structure of cellulose. Nevertheless, disagreements have arisen concerning the accuracy and significance of these data as criteria for studying actinism. Doree and Dyer *(55)* reported that bleached cotton exposed under the quartz mercury lamp showed increases in copper number, in methylene blue absorption, and in sodium hydroxide solubility. Grimes *(80)*, Cunliffe and Farrow *(57)*, and Oguri *(141, 142)* also found increased copper numbers with exposed cellulose. Grimes further stated that the copper number approached a maximum where it continued for a time and then gradually decreased. A greater methylene blue absorption, indicating the acidic type of oxycellulose, was observed by Witz *(59)*; whereas little change in methylene blue absorption but a higher copper number, indicating the reducing type of oxycellulose, was observed by Cunliffe and Farrow *(57)*.

The combined actions of light and air were said by Harrison *(55)* to produce water-soluble, organic substances which had an acid reaction. Van Nostrand *(206)* also noted a decrease in pH but only on exposure in an oxygen atmosphere. Doree and Dyer *(22)* found that insolated cotton was more absorbent than the original fabric and would sink immediately in water. In a literature review *(59)*, it was noted that Walker found altered dyeing properties of cotton which had been exposed to direct sunlight—the damaged cloths would dye with basic colors but not with direct cotton colors.

II. Bast Fibers

Turner *(22)* found ramie and linen to be similar to cotton in resistance to photochemical degradation; jute, however, he found to be much more sensitive than any of these. In fact, even with the advantage of coarse yarns, jute was superior only to silk, considered generally to be the most light sensitive of the natural fibers. In corroboration, Bot and Vreeswijk *(32)* and Sommer *(190)* also found that jute was the most sensitive of the cellulosic fibers. In an anonymous review *(1)*, it was suggested that the sensitivity of jute was due to the decomposition of one of its components, notably tannin. The same brownish discoloration and weakness which were noticed in irradiating fabrics mordanted with tannin were observed in the irradiating of jute. A chemical analysis of the exposed jute disclosed that its tannin content had undergone a complete breakdown. Macmillan and Basu *(126)* observed this same rapid, progressive yellowing of insolated jute. The brown degradation product was found by Callow *(43)* to be water-soluble. From research into actinism on jute, Macmillan and Basu reported three additional effects: (1) extreme dissolution in alkali, (2) decrease in lignin content, (3) lintering, especially in water. Bot and Vreeswijk *(32)* disclosed that samples of jute from which all oil had been extracted were more resistant than unextracted samples to photochemical degradation. Bot and Vreeswijk (21) found decreases in lignin content in both jute and hemp after irradiation; they observed no changes in cellulose content or in yarn weight. In this connection, the ready degradation of lignin which was discussed in the section on "Radiation" could be partly responsible for the light sensitivity of jute which contains relatively large amounts of lignin.

Ramie was given a high rating of light resistance by Brown *(38)*. He suggested that this greater resistance to light action was due to a firmer oxygen linkage or a lower number of discontinuities in the cellulose chain. Mason and Rosevear *(128)* found that ramie irradiated by a quartz mercury arc showed an increase in copper number.

In the literature, little information was available concerning actinism on linen. From ratings found in various tables *(94, 109, 189, 216)*, it appeared to be debatable whether linen or cotton were more resistant to sunlight. Reports on the more basic aspects of actinism on linen did not appear, except for a statement by Barr *(22)* that linen was noticeably bleached by sunlight before a loss in breaking strength could be detected.

III. Wool

In experiments evaluating different textiles, wool is generally rated as the most resistant to photochemical degradation. Vignon *(208)* attributed the greater actinic resistance of the animal fibers over the vegetable fibers to the protein molecules of the former which are not so readily hydrolyzed as the cellulose molecules of the latter.

As proposed for cotton (see "Role of Oxygen"), Harris and Smith *(90)* believed that light produced primary and secondary reactions on wool. The initial effect was said to be an activation of the disulfide groups and the second, an emission of hydrogen sulfide. Trotman and Taylor *(200)* suggested similar reactions. Harris and Smith *(90)* further reported that the evolved hydrogen sulfide was oxidized to sulfuric acid when wool was irradiated in air. Other investigators ascribe the tendering of wool by photolysis to a breakdown of the molecules with subsequent acid oxidation of the freed sulfur to sulfuric acid. Cunliffe *(56)* noted that exposed wool became acid slowly at first and then more rapidly. On finding that actinism on wool produced sulfur dioxide, Barritt and King *(26)* attributed the formation of acid to an oxidation of the sulfur dioxide. Schmidt *(174)* suggested that sulfurous acid was first formed by sulfur oxidation and was then converted into sulfuric acid. Von Bergen *(209)* also observed that the sulfur of wool was converted to sulfuric acid by the combined action of light and air. Related findings by Smith and Harris *(188)*, Von Bergen *(212)*, and Ginsberg *(73)* showed that photochemical degradation of wool was accelerated by acid pretreatment and decelerated by alkali pretreatment. Von Bergen *(212)* noted that wool pretreated with sulfuric acid was the most readily attacked.

Cunliffe *(56)* while investigating the losses in breaking strength suffered by exposed wool noted considerable attendant losses in elongation. He suggested that the degree of damage was more nearly represented by the product of breaking strength and elongation values than by the breaking strength value alone. In addition to weakening the wool, exposure to light produced other measurable changes, both physical and chemical. On comparing wool from the backs and from other parts of sheep, Von Bergen *(213)* noted that the exposed wool of the backs showed evidence of photochemical damage. Examination of insolated and of artificially irradiated wool disclosed similarities in the affected fibers having suffered a brittleness, yellowish brown discoloration, and loss of epithelial scales. An extreme harshness in the texture of fabric undergoing prolonged exposure was observed by La Fleur *(116)*. La Fleur irradiated wool with a carbon arc and found that the sample first became whiter and then yellower with increasing exposure. Schmidt *(174)* reported that bleached wool was yellowed but that natural brown wool was first whitened. Kertesz *(22)* noted that wool exposed to the mercury arc had undergone a destruction of nap similar to the visible destruction of outdoor exposure. Haller *(85)* reported that microscopic examination revealed fractures of the exposed fibers. Wagner *(217)* observed that the fibers were covered with a gluelike substance, not unlike the coating on fibers treated in sodium hydroxide. In a literature review *(213)*, Von Bergen refers to four chemical tests (biuret reaction, nitrogen determination, bichromate test, and phosphate tungstic acid precipitation test) and to three microscopical-chemical tests (Allworden's reaction, Pauly test, and caustic soda reaction). Even before a noticeable decrease in strength, Cunliffe *(56)* and Barritt and King *(26)* found that the Pauly test—a differential dyeing process—showed an alteration of irradiated wool. Other procedures for measuring the degradation of wool disclosed increases in alkali solubility and ammonia nitrogen content and a decrease in cystine content *(22, 116, 188)*. According to Von Bergen *(213)* a 10 percent swelling of wool in sodium hydroxide indicated merely the occurrence of light damage, but a 100 percent swelling indicated that valuable properties of the wool had been completely destroyed. Cunliffe *(56)* found an increased loss in strength when irradiations were followed by a soap and water bath. Wagner *(217)* found that photochemically damaged wool was further affected when it was placed in a neutral or alkaline bath but that an acid bath, because of its coagulating nature, prevented solution of the damaged wool. Following the action of light, wool was noticeably more absorbent *(116, 212)*, but as remarked by Cunliffe *(56)* and Haller *(85)*, the moisture regain was less. The slightly decreased moisture regain returned to normal when Barritt and King *(26)* subjected the wool to a wash and an alkali treatment. The experimental data of La Fleur *(116)* indicated an initial resistance to wetting prior to the increased wettability of irradiated wool. This worker noted that wet wool became increasingly odorous with progressive exposure.

Experiments by Waentig *(216)* indicated that washed wool, poor in fat, was more sensitive to actinism than unwashed wool, rich in fat. Castiglioni *(46)* observed that exposure of degreased wool produced a gray color while exposure of greased wool produced a yellow to brown color. Both Castiglioni and Ginsberg *(73)* attributed the yellowing of wool in the natural state to a charring action involving the cholesterol of the wool fat and the sulfuric acid formed by irradiation. By following the action of light, Ginsberg noted that the natural coloring of the wool was first bleached and that the darker fibers which required a greater period of time for bleaching suffered a smaller breaking strength loss.

Wool that has been damaged by light dyes lighter or heavier than unexposed wool, depending upon the chemical constitution of the dyestuff used *(212)*. The resultant uneven colors present a serious problem to the wool-finishing industry.

IV. Silk

In comparisons of photochemical action on various textiles *(65, 94, 109, 119)* with sometimes as many as six being used, results indicated that silk was the most light sensitive of the fibers. The above investigations, however, in many instances do not record data on all important physical properties of the samples. In fact, Barr *(22)* stated that for yarn of a given weight the initial sensitivity of silk is probably not much greater than that of cellulosic fibers.

As supposed by others in the case of cotton, Bruner and Goehring *(39)* suggested that exposure to light resulted in an initial strengthening of silk. Of untreated, acid-treated, and alkali-treated silks, Harris *(88)* reported that exposure to light caused the greatest deterioration of the acid-treated sample. Harris and Jessup *(89)* and Trotman *(199)* observed that silk fabrics which were finished with a pH 10 were the most stable to the action of light and that the stability decreased rapidly above pH 11 and below pH 3. Bonicatti *(29)*, although corroborating the greater sensitivity of silks pretreated with mineral acids, did not find a protective action with alkali pretreatments. More specifically, Harris *(88)* later reported that light protection had been obtained for silks treated in solutions of 1 percent sodium carbonate.

Actinism on silk is not fully represented by breaking strength. Cadwallader and others *(41)* found a relationship between the fluidity rises and breaking strength losses of exposed silk. Trotman *(199)* and Cormany *(54)* in mercury vapor lamp exposures and Tweedie *(204)* in carbon arc exposures observed that the silk became

a yellowish-brown and that this discoloration increased with time of exposure. The color change and increase in ammonia nitrogen content were taken as indications of an oxidation reaction. Although the increase in ammonia nitrogen content was noticeable, neither Harris nor Tweedie found any change in the amino nitrogen content. As the exposure progressed, Tweedie observed that the viscosity of silk in zinc chloride solution decreased. The photochemical deterioration was accompanied by a decrease in fiber orientation as noted by Bruner and Goehring *(39)*. Although light-degraded silk absorbed and retained more water, Trotman *(199)* found that its affinity for acid or basic dyestuffs was unchanged.

Manufactured Fibers

Because manufactured fibers have appeared only recently, few independent reports of their behavior under sunlight are available. Little information relating to the photochemical action on these fibers has been released by the manufacturers. While some statements on this aspect of behavior have been recorded and are given here, the information should not be considered conclusive. It is only to be expected that manufactured fibers as opposed to natural fibers can be made more nearly to withstand conditions of use. Hall *(84)* reported that the manufactured fibers that are unduly weakened or discolored by sunlight are being modified by introducing suitable components during the manufacturing processes.

It is convenient to discuss the manufactured fibers as semi-synthetics (textiles partially built up from a particular constituent, namely, cellulose, protein, or glass) and as synthetics (textiles entirely built up or synthesized from basic chemical elements) *(185)*.

Below is a chart (Table I) in which are presented tabulated data on the effect of sunlight on some manufactured fibers.

Semi-Synthetics

I. Cellulose Acetate

In 1923, Waentig *(216)* reported that cellulose acetate was more sensitive to light than viscose and cuprammonium rayons. In 1947, Matthews' book *(129)* contained a report showing that the dull acetate of an earlier period had been made as light-resistant as bright acetate. Lawton and Nason *(122)* performed experiments on sheets of cellulose acetate and the relatively light-sensitive cellulose nitrate. Viscosity measurements showed the acetate to be more resistant than the nitrate. Robl *(161)* detected the presence of peroxides in light-damaged cellulose acetate; he suggested that the synthetic could be made more resistant by decomposing the peroxides.

II. Cellulose Nitrate

Carswell and Nason *(45)* attributed the light sensitivity of cellulose nitrate to denitration and cleavage of the cellulose chain. The increases in copper number observed by Montonna and Winding *(136)* were referred to this depolymerization.

III. Viscose

Schäppi (171) found that the light sensitivity of dull viscose was almost double that of bright viscose or cotton and that the sensitivity of the dull rayon was lessened by irradiating in dry air. In agreement with the above finding, Egerton *(64)* noted that the delustering agent, titanium oxide, greatly accelerated the photochemical action of viscose exposed in a moist atmosphere.

Schäppi *(171)* observed that at the start of irradiation the copper number of the weakened viscose increased in linear proportion to the energy of sunlight but that on approaching the end of the exposure period, there was a gradual acceleration of the copper number value. This investigator noted that all fibers of the yarn were damaged homogeneously.

Whittaker *(226)* after irradiating viscose, applied a soap and water treatment and observed an increase in degradation. Experiments in the Swiss Federal Laboratory at St. Gall *(8)* showed that irradiated viscose was alkali-sensitive.

Bleached cotton and viscose exposed to quartz mercury lamp radiation were observed by Williams *(228)* to be damaged at about the same rate. On exposing bleached cotton and viscose to sunlight, Whittaker *(226)* found that viscose was more resistant than bleached cotton.

IV. Casein, Vegetable Protein

The protein can be obtained from an animal source (casein) or from a vegetable source (peanut, soybean, zein).

Sherman and Sherman *(185)* observed that "Aralac" (casein) which was irradiated and then dyed showed results similar to those of light-bleached wool—that is, the exposed Aralac dyed lighter or heavier than the unexposed Aralac, depending upon the type of dye used.

A recent news release (Daily News Record, February 27, 1948) on "Vicara" (vegetable protein) reported that this product was "slowly weakened" by sunlight.

V. Glass

"Fiberglas" is a product of the Owens-Corning Fiberglas Corporation. The articles on this semi-synthetic fiber report that it is stable to the action of light. One writer *(3)* noted that glass textiles had a certain limitation when exposed to weather in general and that the finer fibers were particularly susceptible. To some extent, the glass fibers are soluble, and for this reason, glass yarns woven into fabrics are protected with a lubricant, an oil, or a synthetic resin coating.

Synthetics

VI. Acrylonitrile

Acrylonitrile fibers are said to be remarkable for resistance to deterioration by sunlight *(205)*. In a review of the recent synthetic, Sherman *(184)* also mentioned this unique property. Polymerized acrylonitrile is found in the experimental "Fiber A" of Du Pont.

VII. Polyamide

The degree to which nylon resists deterioration by sunlight depends on the nylon type and also whether it is bright or pigmented semi-dull. Boulton and Jackson *(33)* found that dull nylon was more

(Continued on Page 189)

TABLE I

Fibers	*Effect of Sunlight*[4]	*Effect of Sunlight*[5]
glass	none	none
nylon	loss of tensile strength	prolonged exposure decreases tensile strength
casein, soybean, peanut	(casein and soybean) similar to wool	(casein, soybean, and peanut) similar to wool
acetate	loss of tensile strength	slight on tensile strength; none on color
cuprammonium	loss of tensile strength	slight on tensile; none on color
viscose	loss of tensile strength	loses tensile strength after prolonged exposure; very little discoloration
vinyl resin	none	Vinyon—none Vinyon N—darkens somewhat after prolonged exposure with some loss in tensile strength
vinylidene chloride	darkens slightly	darkens slightly
cotton	loss of tensile strength; tendency for whites to yellow	.....
silk	loss of tensile strength; affected more than cotton	.....
wool	loss of tensile strength; change in dyeing properties; less affected than cotton	.....

[4] Modern Plastics Encyclopedia *3*, No. 8 (1947).
[5] Textile World's Synthetic-Fiber Table (Bendigo, C. W., Textile World *97*, No. 9, 128 (1947).

LOUIS ATWELL OLNEY

THE distinguished career of Dr. Louis A. Olney came to an end on Friday evening, February 11th, when he died at the Onslow County Hospital, Jacksonville, North Carolina, as the result of injuries sustained in an automobile accident in Jacksonville on Monday, February 7th. His wife, Bertha H. Holden Olney, died immediately following the accident. Dr. and Mrs. Olney were en route to Florida for a vacation.

Dr. Olney was born on April 21, 1874 in Providence, Rhode Island and was a direct descendant of Thomas Olney who came from England in 1635 and who was one of the thirteen original proprietors of the colony. Dr. Olney attended public school in Providence and took courses at Bryant & Stratton business college. He then entered Lehigh University and received his B.S. in chemistry in 1896. He was granted an M.S. from Lehigh in 1908 and was honored by his alma mater with an Sc. D. in 1926.

Following a year as an instructor in the chemistry department of Brown University, he became professor of chemistry and dyeing and director of that department at the Lowell Textile Institute.

Mrs. Olney was a native of Lowell and a graduate of Rogers Hall school of that city and received a B.A. degree from Smith College in 1902. She was active in church work and a number of social organizations. She was 71 at the time of her death. Dr. and Mrs. Olney were married on June 24th, 1903.

Surviving are three children: Mrs. E. Alan Larter and Richard H. Olney of Dunstable, Massachusetts and Mrs. Dexter N. Shaw of Wayne, Pennsylvania.

* * *

Dr. Olney will always be remembered for his efforts in establishing the American Association of Textile Chemists and Colorists which Association will long stand as a monument to his memory. He had persistently advocated the formation in this country of a society similar to the British Society of Dyers and Colourists and, following an editorial campaign in the *American Dyestuff Reporter* designed to stimulate interest in the subject, he invited a number of outstanding men in the textile chemical field to attend a meeting at the Engineer's Club in Boston on August 26, 1921 to consider plans for bringing the matter to a head. A subsequent meeting was held at the Chemists' Club in New York on September 13, during the Chemical Exposition, when further ground was covered and it was decided to hold the inaugural meeting in Boston on November 3. At this meeting, Dr. Olney was elected first president and continued in this office until 1927 and was then named president emeritus. He was also the first chairman of the research committee and did not relinquish this position until 1947. Throughout the period of the birth of the Association and during its later growth and expansion he contributed every effort possible to further its aims and objects and he can truly be called the father of the AATCC.

Dr. Olney retained his post at the Lowell Textile Institute for 47 years, retiring in 1944 at which time he was named professor emeritus. His department at the institute grew in importance and stature through the years due to his devotion to his task and the school itself attained an international reputation. Of the long succession of students who attended his classes there are representatives in the majority of dyeing and finishing plants in this country as well as a long list of those who have gone with dyestuff and chemical manufac-

LOUIS A. OLNEY

1874-1949

turers, testing and service laboratories, synthetic yarn manufacturers, etc. Although he was continually tempted by offers from outside the education field, he believed that he could serve the industry best by continuing in that field.

Dr. Olney's association with the *American Dyestuff Reporter* and the Howes Publishing Company dates back to 1920 when the late Mr. A. P. Howes induced him to take over the editorial direction of the *Reporter.* He continued as directing editor until his death. He was a director of the Howes Publishing Company for many years and was named president last Fall to succeed Mr. Howes.

In 1943 the Olney Medal was endowed by the Howes Publishing Company as an award to be made by the AATCC for outstanding achievement in the field of textile chemistry. The purposes of this medal are to encourage and to afford public recognition of such achievement and contributions and to be a testimonial to Dr. Olney in recognition of his lifetime of devotion and multitudinous contributions to this field. Dr. Olney himself was awarded the first medal in 1944.

Dr. Olney was president of the Wannalancit Textile Company of Lowell, president of the Lowell Institution for Savings and president of the Lowell Morris Plan Company. He had been president of the Stirling Mills of Lowell for many years. He served as an assistant editor of *Chemical Abstracts* and as a consultant to numerous concerns. He was the author of several books including "Elementary Organic Chemistry" and "Chemical Technology of the Fibers". He also contributed portions to other books in the chemical field and numerous articles to technical publications.

Although his greatest devotion was to the AATCC Dr. Olney was also active in other textile and chemical associations. He was honored last year for his 50 years of membership in the American Chemical Society. He was a charter member of the American Society of Chemical Engineers and a fellow of the American Association for the Advancement of Science. He was also a member of the American Institute of Chemists, the British Society of Dyers and Colourists, the British Society of the Chemical Industry and the National Association of Wool Manufacturers. He had also been active in the Textile Research Institute and its predecessor, serving as an officer and member of the board of directors. He had also been a director of the Lowell Board of Trade.

Dr. Olney also had an active interest in other societies other than in the business field. He was an ardent stamp collector and a member of the Boston Philatelic Society. He had served as treasurer of the Northfield Conference of Religious Education and was a member of the Lowell Historical Society. He had been a president of the Lowell YMCA and of the New England Lehigh Club. He was a Scottish Rite Mason and a Knight Templar, a member of the Engineers' Club of Boston, the Chemists' Club of New York and the Yorick and Vesper Country Clubs of Lowell.

* * *

Dr. Olney was of strong New England character, impartial in judgment and fair in demands. His distinguished appearance, his unruffled manner, his persuasive nature and his keen intelligence were all admirable qualities that served him well. It has been the good fortune of the textile and chemical industries that these attributes were used in their behalf. Never one to seek honor or fame, his acceptance speech as first president of the AATCC was of characteristic brevity and self-effacement:

> "Gentlemen, I wish to thank you for the courtesy you have extended. As one of those actively interested in the formation of this association, I feel that someone else should be the first president, because I am afraid my close association with it may have narrowed my views in certain respects and made me too optimistic in others, and for those reasons some other guiding hand would be far better. But, if it is the will of the nominating committee, and your wish as well, all I can say is that I shall endeavor to do the very best I can as president of the organization for the coming year, and I know from the enthusiasm which has been shown so far that I shall receive the support of all."

Dr. Olney's passing leaves a void in the hearts of his friends, former students, associates, and members of the AATCC which can never be filled.

To the Members of the
American Association of Textile Chemists and Colorists:

In Memoriam

LOUIS ATWELL OLNEY is dead. His maker recalled him at a time and in a manner which only the inscrutable wisdom of the ruler of all destiny can account for. Whether you knew him as Professor, Doctor or simple "Doc"—as Mr. or just plain Louis—he was a gifted and striking individual. The mills and banks of which he was a director, the hundreds of students whom he taught at Lowell Textile Institute and influenced for the rest of their lives, the thousands of members of the American Association of Textile Chemists and Colorists, which society he personally founded—today reflect in sorrow over the loss of their leader, friend and counsellor.

Scientist, educator, publisher, author and pioneer in the organization of textile chemistry—Louis A. Olney was a personality whom the accident of death cannot stamp out. Together we stand—6,000 of us—members of his A.A.T.C.C., somewhat tremulous over the realization that we are now "on our own." For more than a quarter of a century he has led us. He has molded out of a handful of textile technicians a society, recognized throughout the scientific world, representative of the intellect of the functional personnel of the industry. Even those who have had the titles of high office in this Association acknowledge the influence of Dr. Olney's unusual aptitude for understanding problems affecting science in relation to the masses.

Dr. Olney is dead but not gone. To his title of President Emeritus of our Association I will ask the Council to vote posthumously the added distinction of "Founder." As long as we have an Association, an Olney Medal award, and our published proceedings, the name of Louis Atwell Olney will continue in time as Founder and President Emeritus of the American Association of Textile Chemists & Colorists. Those who knew and loved him best cannot visualize him all alone on our visioned Mount Olympus. His wife, Bertha Holden Olney, crossed the great divide with him. A gracious lady who endeared herself to all who had the privilege of knowing her, she is inseparably wound up in our affection for our Founder. With anything, we, as pawns in the ultimate destiny may conceive about what is ahead of us, we can visualize Dr. Olney standing hand in hand with a smiling Mrs. Olney as we last saw them in Augusta—!

God keep you both—in His blessed care we commit you—God be with you till time runs out.

A sorrowful tribute from

your President

HENRY F. HERRMANN

Proceedings of the

American Association of Textile Chemists and Colorists

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February 21, 1949

Report, Western New England Section

December, 1948, Meeting

THE December meeting was held on Friday, the 3rd, at the Stony Hill Inn, Danbury, Connecticut. Present were 110 members and guests.

Dr. R. Bowling Barnes, Vice-president in charge of Research for the American Optical Company, spoke on "Optical Instruments in the Textile Industry", reviewing recent developments in optical instruments, many of which have direct applications in textile production and research.

Also included in the program of this meeting was a demonstration of small scale hat making machinery and a film describing the process of hat manufacturing. Five hats were donated by the Frank H. Lee Hat Company. Special thanks are due the committee consisting of Joseph Melody, *Chairman*, R. J. Carey, R. N. Brownlee, E. Otto, R. Pezet, M. Lasher, Mr. Ryan, and also to the Frank H. Lee Hat Company, who provided the film.

Respectfully submitted,
EDWARD A. MURRAY,
Secretary.

January, 1949, Meeting

THE January meeting of the Western New England Section was held on Friday, the 14th, at Rapp's Restaurant in Shelton, Connecticut. Attendance totaled 66 members and guests.

Dr. H. Mark, Professor of Organic Chemistry at the Polytechnic Institute of Brooklyn, spoke on "Recent Developments in Textile High Polymers" outlining the structural differences which exist between fiber-forming high polymers and those which have the characteristics of plastics or elastomers. Emphasis in his talk was placed on the significance of degree of crystallinity, branching or cross-linking, and molecular weight in relation to tensile strength, dyeing properties, solubility, softening temperature, and other physical properties.

Respectfully submitted,
EDWARD A. MURRAY,
Secretary.

Research Highlights

FASTNESS TO LIGHT

Fade-Ometer users will be glad to know that the new calibration papers will shortly be available from the U. S. Bureau of Standards.

FASTNESS TO WASHING

Work is still in progress on the development of a new Launder-Ometer test to predict serviceability of colored fabrics in commercial laundering. AATCC is collaborating with American Standards Association and others in a consumer survey which will determine the attitude of the housewife on acceptable degrees of color change as a result of washing.

January 28th Meeting, New York Section

A MEETING of the New York Section was held on Friday evening, January 28th, at the Hotel New Yorker, New York City. An informal dinner preceded the meeting.

Seated at the head table were the following national officers introduced by the chairman, Charles W. Dorn: C. Norris Rabold, *Vice-President*, Dr. Harold W. Stiegler, *Director of Research*, and Dr. Harold C. Chapin, *Secretary*. Introduced from the floor was John N. Dalton, also a *Vice-President*.

COLOUR INDEX

A few more copies of the "Colour Index" and "Supplement" of the British Society of Dyers and Colourists are available at $30.00 per set, postpaid, in the United States from the

Secretary, AATCC
Lowell Textile Institute
Lowell, Massachusetts

Ernest Hart, Chairman of the New York Section Corporate Membership Committee and Vice-Chairman of the National Committee, reported that 75% of the Corporate Members in the New York area had been contacted and, with 26 of these still to report, there had been an increase in corporate dues of $5375. There are still 30 Corporate Members to be contacted.

It was announced that at the March 4th meeting, to be held at the New Yorker, A. W. Staudt, Manager, Technical Service, Nylon Division, E. I. du Pont de Nemours & Co., Inc., would speak on "Nylon, Its Properties, Its Problems, and Some of the New Research and Developments". The new DuPont film "This is Nylon" will also be exhibited at this meeting.

The following technical program was presented:

"Short Ageing Processes for the Printing of Synthetics, Silk and Wool" by Dr. A. K. Saville, Technical Laboratory, E. I. du Pont de Nemours & Co., Inc.;

"Trade Practice Rules and Test Procedures for Textiles" by Henry Miller, Director, Trade Practice Conferences and Wool Act Administration, Federal Trade Commission.

Attendance was approximately 300.

Respectfully submitted,
NORMAN A. JOHNSON,
Secretary.

—◆ ◆—

February 26th Meeting, Mid-West Section

AT the winter meeting of the Mid-West Section to be held on February 26th at the Bismarck Hotel, Chicago, papers will be presented at afternoon and evening sessions.

At 2:30 P.M. R. G. Thomas, technical representative for Rohm & Haas Company will discuss "Resin Finishing of Textile Fabrics". There will be an exhibit of fabrics illustrating the paper.

Dinner will be served at 7:00 P.M. following which Dr. O. M. Morgan of the National Aniline Division of Allied Chemical & Dye Corporation will give an illustrated lecture on "Low Temperature Wool Scouring with a Synthetic Organic Detergent."

Membership Applications

SENIOR

E. Dare Bolinger, Chemist, Deering Milliken Research Trust, Stamford, Conn. Sponsors: E. A. Murray, A. G. Balfrey.

Ernest A. W. Boyce, Chemist, Dominion Textile Co., Ltd., Magog, Que., Can. Sponsors: R. W. Redston, H. K. Torpey.

Thomas A. Bramfitt, Plant Supt., Cluett, Peabody Co., Troy, N. Y. Sponsors: J. Epelberg, L. S. Lang.

William H. Brinkley, South. Sales Mgr., E. F. Houghton Co., Charlotte, N. C. Sponsors: R. H. Smith, C. B. Kinney.

Owens H. Browne, Chemist, Habow Chemical Co., Conover, N. C. Sponsors: W. F. Biggers, R. H. Smith.

Jacques P. Cadgene, Owner, Cadgene Machinery Co., Paterson, N. J. Sponsors: R. E. Rupp, G. F. Langhirt.

Frank G. Calkin, Sales Repres., Oronite Chemical Co., New York, N. Y. Sponsors: G. E. Hopkins, C. R. Gill.

William B. Calvert, Plant Mgr., Portland Woolen Mills, Inc., Portland, Ore. Sponsors: T. M. Marshall, A. H. McKenzie.

Charles H. Carter, Pres., Portland Woolen Mills, Inc., Portland, Ore. Sponsors: T. M. Marshall, A. H. McKenzie.

Norman S. Cassel, Div. Pres., Textile Colors Div., Interchemical Corp., Fair Lawn, N. J. Sponsors: A. K. Haynes, C. R. Gill.

Clyde F. Chace, Supt. Textile Plant, The Columbia Mills, Inc., Minetto, N. Y. Sponsors: D. P. Knowland, W. B. Broadbent.

Joe D. Clary, Tech. Director, Chemical Products Corp., Cartersville, Ga. Sponsors: S. J. Davis, D. Richardson.

William B. Coleman, Res. Chemist, Victor Chemical Works, Chicago Hgts., Ill. Sponsors: G. M. Cote, C. R. Gill.

John B. Cook, Jr., Supervisor, E. I. du Pont de Nemours & Co., Inc., Deepwater, N. J. Sponsors: W. E. Railing, P. J. Wingate.

Eugene V. Correll, Dyer, Kerr Bleaching & Finishing Work, Concord, N. C. Sponsors: C. N. Rabold, W. A. Wardell.

Alvaro J. Costa, Salesman, Costas & Fernandes Lda., Porto, Portugal. Sponsors: C. A. Seibert, C. A. Sylvester.

Herman M. Cotton, Pres., Empire Processing Co., Inc., Cohoes, N. Y. Sponsors: D. O. Hamer, W. A. Nelson.

Roderick J. Cowles, Research Chem. Engr., Schenectady, N. Y. Sponsors: J. Epelberg, L. S. Lang.

Fali F. Darbary, Asst. Dye. Bleach. & Finish. Master, Tata Industries, Ltd., Bombay, India. Sponsors: W. H. Cady, E. F. Mulally, Jr.

John K. Davis, Finisher, Cranston Print Wks., Cranston, R. I. Sponsors: E. W. Lawrence, H. J. Cranston.

Daniel G. Deddo, Plant Mgr., Ben Rose Hand Printed Textiles, Chicago, Ill. Sponsors: V. C. Braun, H. W. Ericson.

John H. Dillon, Dir. of Research, Textile Research Inst. & Textile Foundation, Princeton, N. J. Sponsors: H. F. Herrmann, C. N. Rabold.

Harley A. Dimick, Foreman of Finish., Portland Woolen Mills, Inc., Portland, Ore. Sponsors: T. M. Marshall, A. H. McKenzie.

George L. Dorough, Mgr., Peroxygen Products, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Sponsors: N. P. Arnold, C. R. Gill.

John S. Entwisle, Chemist, Haas-Miller Corp., Philadelphia, Pa. Sponsors: W. M. Kirk, H. L. Miller.

Melvin R. Espeland, Salesman, Eaton Chemical & Dyestuff Co., Detroit 7, Mich. Sponsors: R. P. Cole, R. F. McDonald.

Boyce L. Estes, South. Repres., Clinton Industries, Inc., Clinton, Iowa. Sponsors: S. J. Davis, D. Richardson.

Alfred H. Fearn, Foreman, Bleach. & Dye. Dept., Duofold, Inc., Mohawk, N. Y. Sponsors: I. J. Smith, J. H. Atkinson.

Joe D. Fortenberry, Overseer, Bleach. & Finish., Startex Mills, Tucapau, S. C. Sponsors: J. L. Moore, O. S. McCullers.

Angelo Gallo, Dyer & Supt., Commercial Dye House, Inc., Los Angeles, Calif. Sponsors: F. L. Wilhelm, F. Haselhorst.

(Continued on Page P171)

CALENDAR

WESTERN NEW ENGLAND SECTION
Meetings: February 25, April 8, May 20.

NEW YORK SECTION
Meetings: March 4, April 1, May 6.
Outing: June 17.

PHILADELPHIA SECTION
Meetings: March 11, April 15, May 20, September 16, November 11 (Kugler's, Philadelphia).
Outing: June 10.

PIEDMONT SECTION
Meetings: April 2 (Robert E. Lee Hotel, Winston-Salem, N. C.), June 24, 25, 26 (Ocean Forest Hotel, Myrtle Beach, S. C.), November 5 (Charlotte Hotel, Charlotte, N. C.)

HUDSON-MOHAWK SECTION
Meetings: March 18, May 20, September 16, November 18.
Outing: June 17.

MID-WEST SECTION
Meeting: February 26 (Bismarck Hotel, Chicago).

COUNCIL
Meeting: March 25 (Hotel New Yorker, New York).

RESEARCH COMMITTEE
Meeting: March 25 (Hotel New Yorker, New York).

NATIONAL CONVENTIONS
1949: October 13 to 15, Chalfonte-Haddon Hall, Atlantic City.
1950: October 19 to 21, Statler, Boston.

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

48-25

Education: R. I. School of Design, evenings.
Experience: 24 years, 10 as Boss Dyer, with same company, recently liquidated; varied experience, in particular warp, skein and package dyeing, and bleaching.
Age 53; married; N.E. preferred, as dyeing supervisor or demonstrator.
1-10, 1-24, 2-7, 2-21

48-26

Education: Textile School.
Experience: 31 years overseer and superintendent of cotton bleaching, dyeing and finishing; retired at age limit.
Age 66; in excellent health; married; interested in work anywhere along Atlantic coast. 1-24, 2-7, 2-21, 3-7

49-1

Education: B.T.C., Lowell Textile Institute.
Experience: Laboratory technician, cost research, quality control, following army service.
Age 26; married; references.
1-24, 2-7, 2-21, 3-7

49-2

Education: High school, with college evening courses in chemical engineering.
Experience: Chemist, U.S. Navy and dye house.
Age 27; married; vicinity of New York City preferred. 1-24, 2-7, 2-21, 3-7

49-3

Education: Textile High School.
Experience: U. S. Army, clerk, one year textile colorist.
Age 24; married; reference.
2-7, 2-21, 3-7, 3-21

Inquiries regarding the EMPLOYMENT REGISTER should be directed to the National Secretary

Intersectional Contest—

PRELIMINARY STUDY OF VARIABLES IN PADDING*

NEW YORK SECTION

Committee

W. G. Helmus, *Chairman and Speaker*
H. P. Bauman, *Secretary*
F. S. Richardson
M. M. Eckhardt
L. S. Thompson
R. J. DeWitte
O. W. Clark
C. H. Brubaker

Introduction

THERE is a deplorable lack of data on the characteristics and performance of squeeze roll equipment despite the widespread use of such equipment by the textile industry throughout its modern history. The inquisitive mill executive has been unable to get much help either from the sparse literature on the subject or from discussions with technicians who might reasonably be expected to be well versed in the subject.

This present investigation was undertaken to provide data on squeeze roll operation and thereby facilitate the more intelligent use of such equipment in practical mill operations. Because of limitations in time, personnel, and facilities this work is strictly a preliminary exploration of some aspects of the subject. It was carried out mainly on practical mill equipment in order that observations might be directly applicable to mill operations. The mill trials were supplemented by a limited number of laboratory experiments on a padder which was similar in all dimensions, except width, to a typical mill padder. These laboratory trials provided data which could not be obtained with sufficient accuracy or over a sufficient range in the mill without excessive interference with mill production.

Interpretation and application of the data in this paper should be made with full realization of the limitations inherent in working with normal mill equipment under existing mill conditions. The results are indications rather than rigorously validated conclusions and the data is relative rather than absolute in degree. Many more investigations of squeeze roll behavior must be made under exact scientific and statistical control, and thorough studies must be made of factors, which either are not included in the present paper or are only partially covered. In particular, it should be kept in mind that this investigation is restricted almost entirely to the pick-up of water and that the practical significance of the conclusions may be modified somewhat when considered in relationship to other factors which could not be studied at this time, such as distribution, penetration, viscosity of bath, and absorption of dye. Starting with this paper as a basis, individual mills should investigate specific problems on their own equipment and under their own conditions.

* Presented in Intersectional Contest, Augusta National Convention, October 23, 1948.

Definitions

Most of this investigation was devoted to a study of "pick-up" as it is commonly termed in the textile industry. For the purposes of this paper, pick-up is defined as:

$$\frac{Wl}{Wc} \times 100 = \% \text{ Pick-up}$$

Wl = the weight of liquid retained by the cloth leaving the nip.

Wc = the original weight of the cloth, determined on cloth, conditioned at the standard conditions of 70° F. and 65% relative humidity.

All mill padders were pneumatically loaded and applied loads taken from the gauge readings.

The nip width was measured by placing carbon paper and a sheet of white paper in the nip and then measuring the width of the impression made at various applied loads.

$$\text{Applied in pounds per linear inch} = \frac{T}{L}$$

* T = total applied load in pounds
L = length of rolls in inches (contact length)

$$\text{Pressure in pounds per square inch} = \frac{T}{LW}$$

W = width of nip in inches

The distribution of the pressure across the nip was calculated by use of the formula:*

$$p = \frac{2P}{3.1416\,A^2}\sqrt{A^2-X^2}$$

p = pressure in pounds per square inch at any point.
X = distance in inches from center of nip.
P = total applied load in pounds per linear inch.
A = ½ of nip width.

A total of fifteen fabrics were tested under various plant conditions to determine the amount of pick-up. Four different padders were employed to provide comparative data under different squeeze roll conditions.

Padder A was judged to be representative of many modern padders now in routine use and therefore most of the charts are based on data procured on this padder.

Factors in Pick-Up

The following statement embodies the most important conclusion derived from this investigation.

Adequately to explain pick-up behavior, cognizance must be taken of the following contributing factors and of their *relative* importance in each *specific case.*

A. Absorption of liquor by:
   1. The fiber as affected by its chemical and physical characteristics.
   2. The yarn as affected by its construction.
   3. The cloth as affected by its construction.

B. Extraction of liquor from:
   1. The fiber as affected by its chemical and physical characteristics.
   2. The yarn as affected by its construction.
   3. The cloth as affected by its construction.

* Formula secured from Bulletin Book, second edition, 1947. Page 31. Kenwood Mills, F. L. Huyck & Sons.

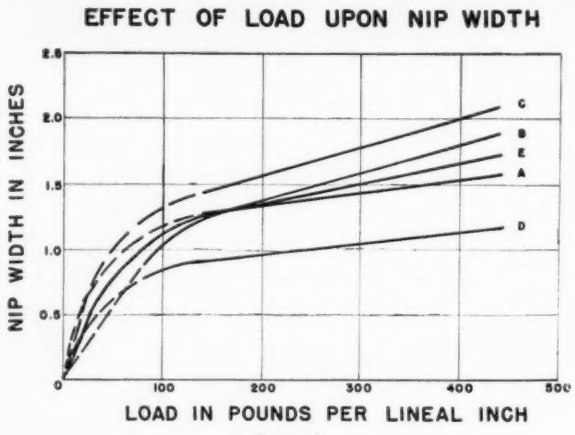
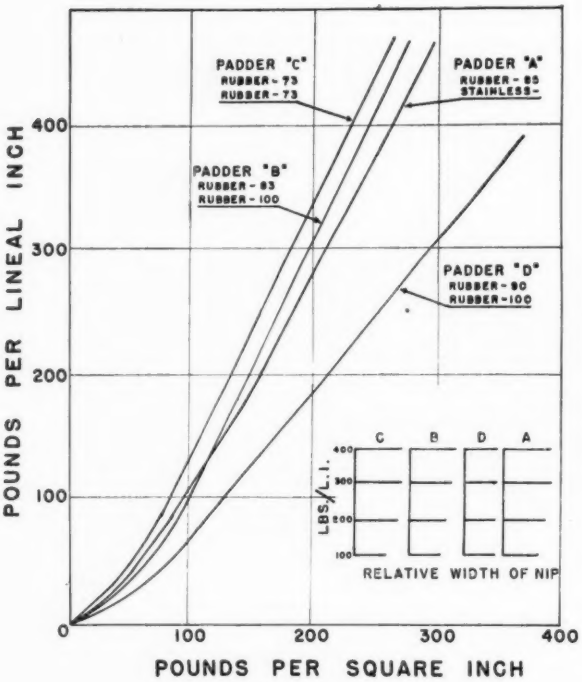


Figure 1



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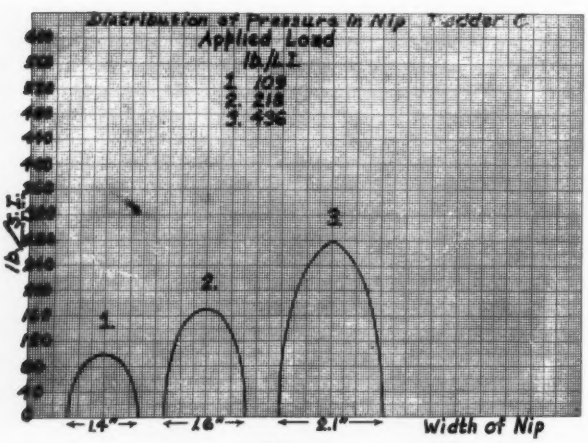

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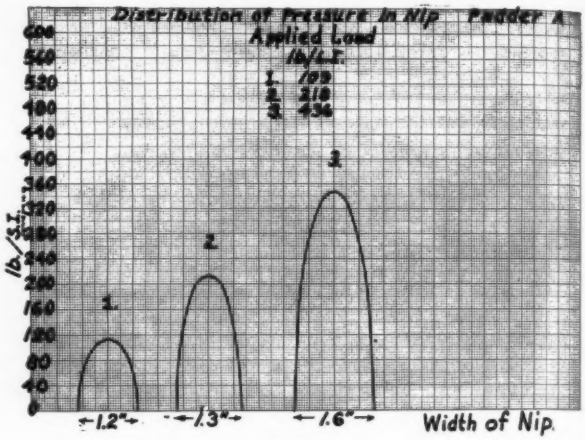

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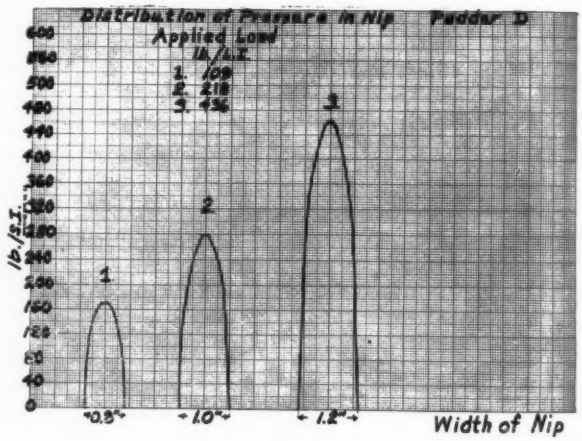

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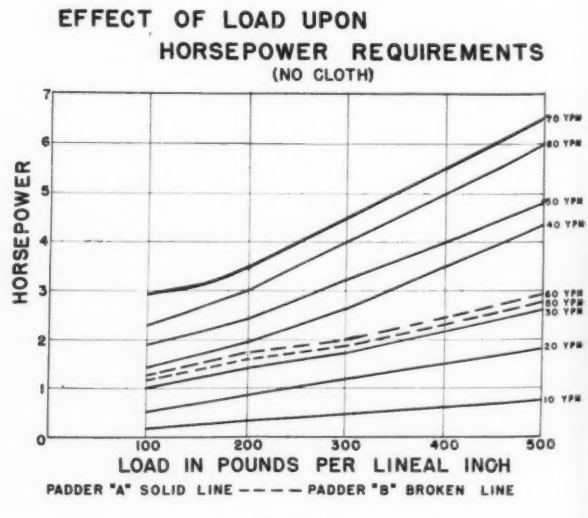


Figure 6

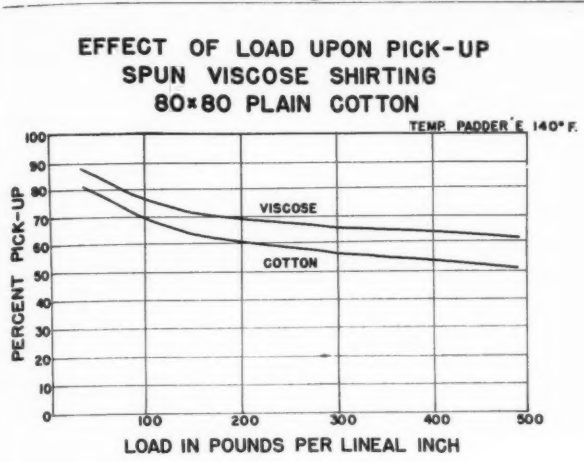


Figure 7

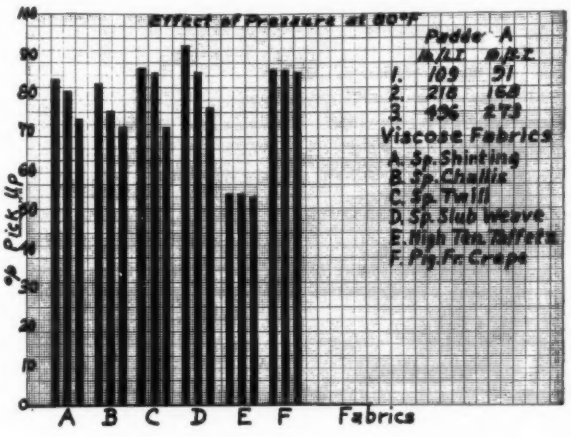


Figure 10

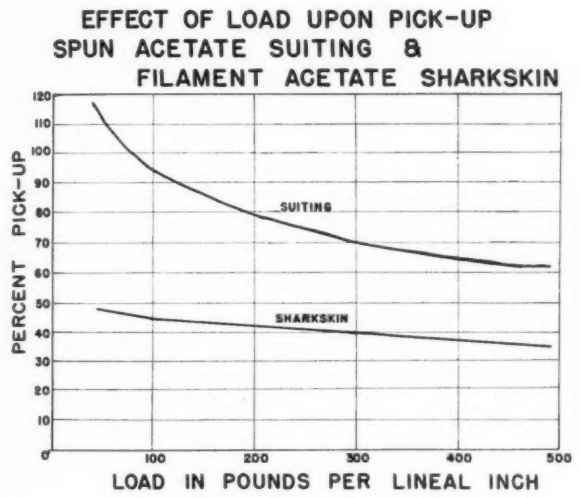
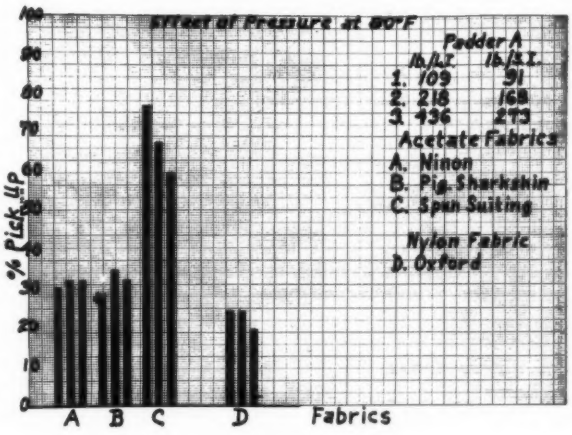


Figure 8



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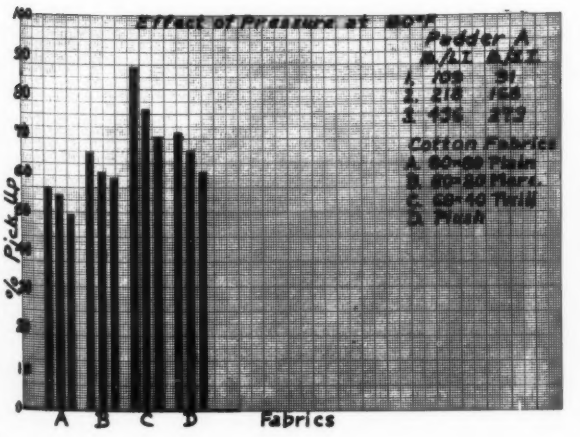

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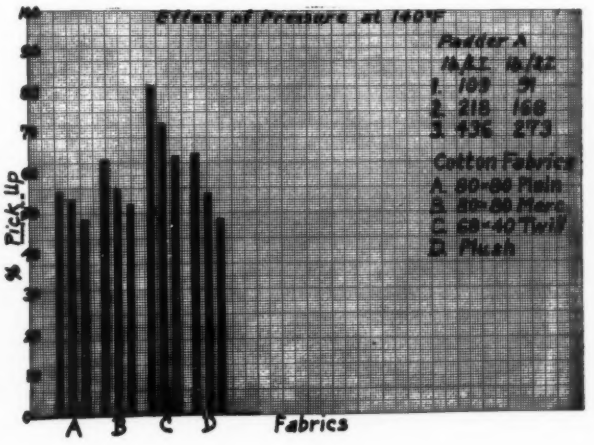


Figure 12

C. Effect of chemicals upon the absorption and upon the extraction of liquor.
D. Effect of temperature upon the absorption and upon the extraction of liquor.
E. Effect of immersion time upon the absorption of liquor.
F. Effect of time in the nip upon the extraction of liquor.
G. Effect of the nip characteristics upon the extraction of liquor.

Padder Characteristics

Applied load versus squeezing behavior of 4 different makes of mill padders was studied and it was found that despite considerable differences in the kinds and combinations of rolls, that *insofar as pick-up of water is concerned and within the scope of this investigation*, the important factor when comparing padders is the extent to which the width of the nip increases as the load upon the padder is increased. A good deal of the work will be shown on charts which will explain more clearly the characteristics of the different pick-ups.

Effect of Load on Width of Nip

Figure 1 shows the effect of load upon the nip width of four commercial mill padders. (Marked A B C D.)

Figure 1 also shows the effect of load upon the nip width of the laboratory padder, E.

Pounds Per Square Inch vs. Pounds Per Lineal Inch

Figure 2 shows the pounds per square inch developed in the nip of four commercial padders as the total applied load in pounds per lineal inch of nip is increased.

Distribution of Pressure in the Nip

Figures 3, 4 and 5 show the distribution of pressure across the nips of three commercial padders, C, A, and D, which respectively have rolls of increasing hardness. As the hardness of the rolls increases, the width of nip is less and the pounds per square inch is greater for a specific applied load. Stated another way, the harder the rolls, the smaller is the area of cloth which is subjected to squeezing action at any specific padder loading.

Power Requirement at Various Loads and Speeds

Figure 6 shows the power requirements for various loads and speeds with both padder A and Padder D.

Effect of Applied Load on Pick-Up—Padder E

Figure 7 shows the effect of load upon pick-up of two cellulosic fabrics: 80x80 unmercerized cotton print cloth, and spun viscose shirting. This data was secured on laboratory padder E because a wider range of experimental conditions could be used than on mill equipment.

Figure 8 shows the effect of load upon pick-up of two acetate rayon fabrics: a pigmented *filament* acetate sharkskin, and a *spun* acetate suiting. This data was secured on laboratory padder E.

Since these curves indicate that at loads above, about 200 lbs. per lineal inch, the pick-up decreases very slowly, and in addition the horsepower requirements rise rapidly with pressures above 200 lbs. per lineal inch, the advisability of exceeding this optimum pressure is a point for consideration.

Effect of Pressure

Increased pressure increases the extraction of water. The influence of increased pressure on pick-up, however, depends upon the net balance resulting from the interplay of the many factors listed earlier in this paper.

Effect of Pressure on Pick-Up at 80° F.—Padder A

Figure 9 shows the effect of pressure on pick-up of four cotton fabrics when padded through water at 80° F. In each case the pick-up decreased as the pressure was increased.

Figure 10 shows the effect of pressure upon the pick-up of six viscose rayon fabrics when padded through water at 80° F. In the case of four spun viscose fabrics the pick-up decreased as the pressure was increased. The filament viscose fabrics showed very little decrease in pick-up as the pressure was increased, indicating that the water which could be removed by pressure came out rather easily, but that the remaining water was tenaciously held even when the load applied to the padder was quadrupled. Note the relatively low pick-up of the high tenacity taffeta.

Figure 11 shows the effect of pressure upon the pick-up of three acetate rayons and one nylon fabric when padded through water at 80° F. Increased pressure has little effect upon the pick-up of the ninon. With the pigmented filament sharkskin the effect of doubling the pressure is to drive more water into the fabric, but when the pressure is quadrupled, this effect is over-balanced by the extractive effect and the net result is a drop in pick-up. The pick-up of the spun acetate suiting decreases with increased pressure similar to the behavior of spun rayon, indicating that the fabric construction can exert more effect on pick-up than the kind of fiber. Quadrupled pressure is necessary to decrease the pick-up of nylon oxford.

Effect of Pressure on Pick-Up at 140° F.—Padder A

Figure 12 shows the effect of pressure upon the pick-up of four cotton fabrics when padded through water at 140° F. In each case the pick-up decreased as the pressure was increased.

Figure 13 shows the effect of pressure upon the pick-up of six viscose rayon fabrics when padded through water at 140° F. In the case of the four spun viscose fabrics the pick-up decreased as the pressure was increased. The high tenacity filament viscose taffeta showed practically no difference in pick-up at various pressures and the pigmented filament French crepe showed too little decrease in pick-up to be of practical importance. Note the relatively low pick-up of the high tenacity taffeta.

Figure 14 shows the effect of pressure on the pick-up of three acetate rayons and one nylon oxford fabric when padded through water at 140° F. It is interesting to note the comparatively large pick-up of spun acetate suiting in comparison with the low pick-up of filament acetate sharkskin. Increased pressure had little effect upon the pick-up of the filament acetate sharkskin. Quadrupling the applied load decreased the pick-up of spun acetate suiting about 25% and of acetate ninon and nylon oxford about 20%.

Effect of Pressure on Pick-Up at 200° F.—Padder A

Figure 15 shows the effect of pressure on the pick-up of four cotton fabrics when padded through water at 200° F. In each case the pick-up decreased with increased pressure, averaging about a 20% drop when the pressure was quadrupled. In the case of the mercerized fabric, quadrupling the pressure had little more effect than doubling the pressure.

Figure 16 shows the effect of pressure on the pick-up of six viscose rayon fabrics when padded through water at 200° F. In each case the pick-up decreased with increased pressure. For all fabrics except the spun viscose shirting, the drop in pick-up was about 10% when the applied load was doubled and little additional drop was secured when the applied load was quadrupled instead of doubled. In the case of the spun viscose shirting, the drop in pick-up was about 3% when the applied load was doubled and about 10% when it was quadrupled.

Figure 17 shows the effect of pressure on the pick-up of three acetate fabrics and one nylon fabric when padded through water at 200° F. The pick-up of the filament acetate sharkskin was unaffected by quadrupling the applied load. Doubling the applied load decreased the pick-up of acetate ninon and nylon oxford about 23%

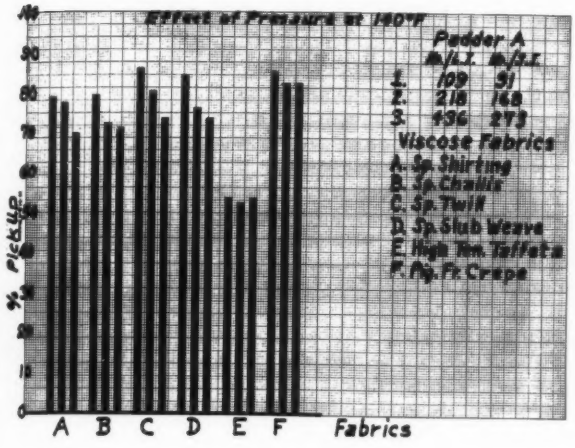
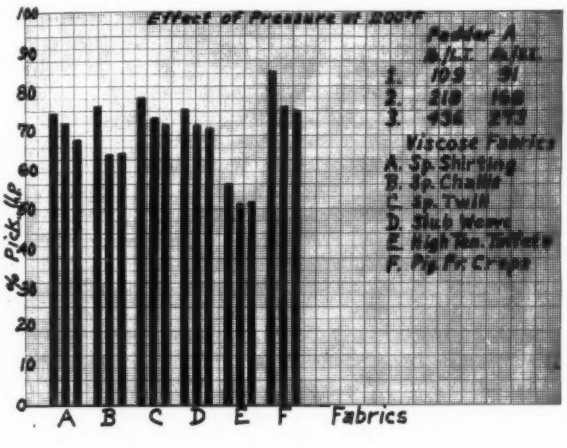


Figure 13



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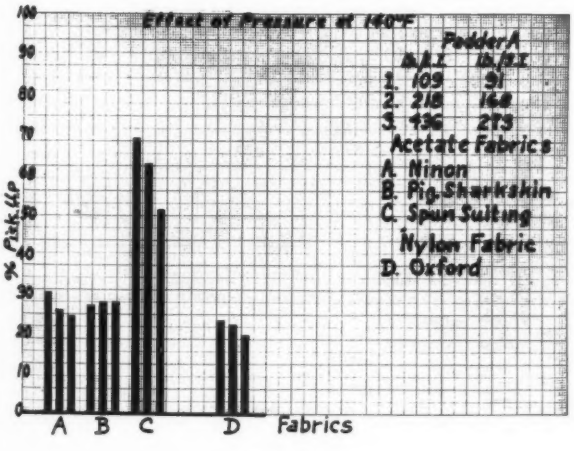

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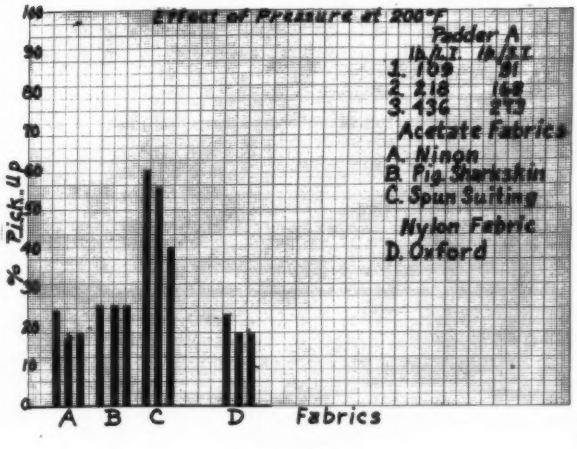

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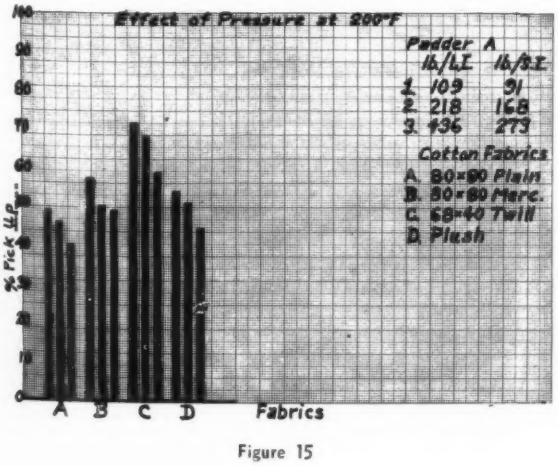
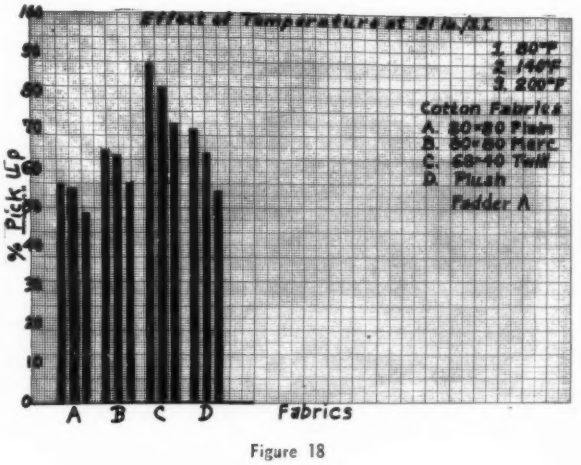


Figure 15



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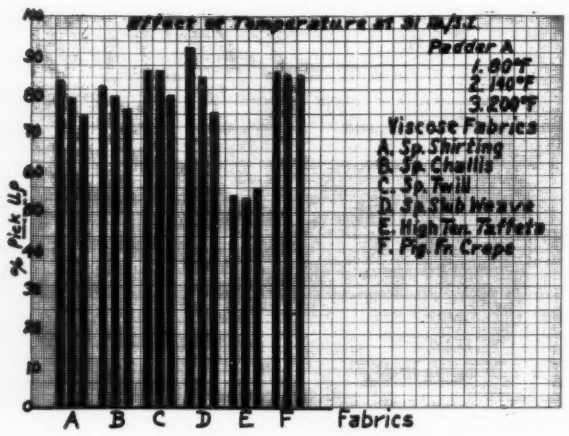

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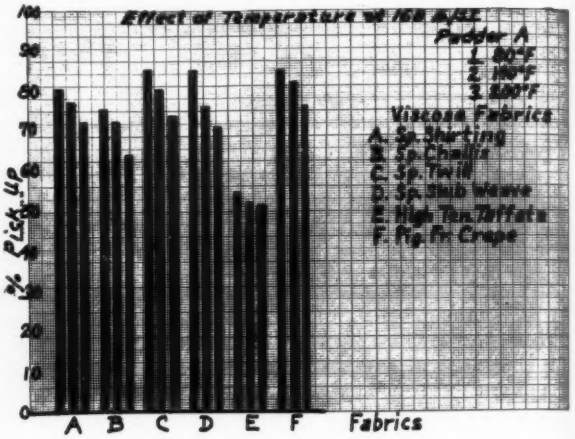

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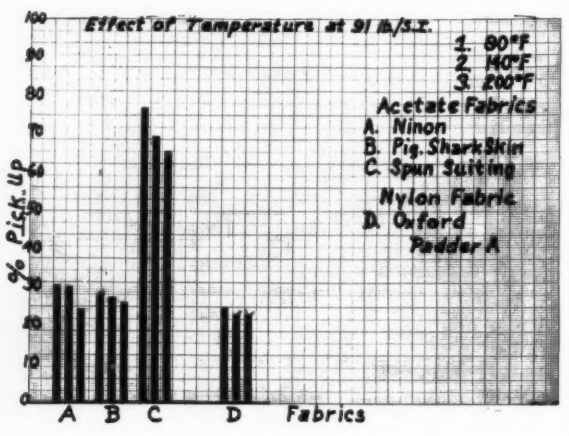

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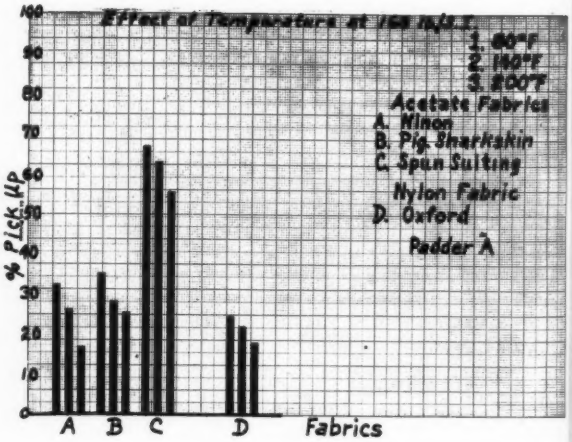

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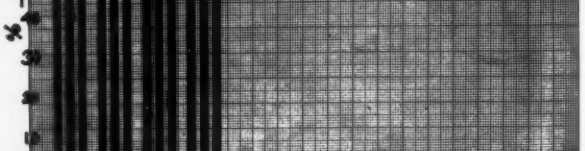


Figure 21

Figure 24

and quadrupling the applied load was of no additional advantage. The pick-up of the spun acetate suiting was decreased only 6% by doubling the pressure but the decrease in pick-up was about 33% when the pressure was quadrupled.

Effect of Temperature

The effect of increased temperature is to increase the absorption of water. The magnitude of this effect is influenced by the inherent wettability of a fabric and for easy-to-wet fabrics it may be rather small. Increased temperature greatly increases the mobility of water and frequently the much greater ease of extracting water at high temperatures strongly overbalances the small increase in water absorption at high temperatures, with a consequent net result of lower pick-up at higher temperatures.

Effect of Temperature on Pick-Up—Padder A-91 Lb. Sq. In.

Figure 18 shows the effect of temperature on the pick-up when four cotton fabrics were padded through water. In all cases, the higher the temperature, the lower the pick-up. This can be attributed to the fact that the greater ease of extracting water as the temperature is increased overbalances the slightly greater ease of absorption of water at higher temperatures, and it illustrates the necessity for considering relatively all the factors in pick-up which were listed in the early part of this paper. When the temperature is increased from 140° to 200° F., the drop in pick-up is greater than when the temperature is increased from 80° F. to 140° F.

Figure 19 shows the effect of temperature on pick-up when six viscose rayon fabrics were padded through water. The four spun viscose fabrics exhibit from 10% to 20% drop in pick-up when the temperature is increased from 80° F. to 200° F. The pick-up of the two filament viscose fabrics is little affected by variations in padding temperature.

Figure 20 shows the effect of temperature on the pick-up when three acetate fabrics and one nylon fabric were padded through water. Increased temperature exerted little effect on the pick-up of the filament acetate sharkskin and the nylon oxford. The pick-up of the acetate ninon was not affected by an increase in temperature from 80° F. to 140° F. but a drop of about 20% was secured when the temperature was increased from 140° F. to 200° F. It is interesting to note the high pick-up of spun acetate suiting. The pick-up of this fabric dropped in proportion to the increase in temperature and totaled about a 20% drop when the temperature was increased from 80° F. to 200° F.

Effect of Temperature on Pick-Up—Padder A-168 Lb./Sq. In.

Figure 21 shows the effect of temperature on pick-up when four cotton fabrics were padded through water. In all cases, the higher the temperature, the lower the pick-up. The light weight plain weave cotton fabrics show a greater drop in pick-up when the temperature is increased from 140° to 200° F. than when the temperature is increased from 80° F. to 140° F. The cotton twill however, now shows a similar drop in pick-up between 80° F. and 140° F. and between 140° F. and 200° F. the higher pressure of 168 lbs. per square inch, overcoming the inherent difficulty of extracting water from this fabric at the lower temperatures. The cotton plush now shows a greater drop in pick-up when the temperature is raised from 80° F. to 140° F. than when it is raised from 140° F. to 200° F. This is because the increased extractive effect of 168 lb. per square inch versus 91 lbs. per square inch overbalances the difficulty of extracting low temperature water with respect to the poorer absorption of water at low temperatures. At higher temperatures, the increased extractive effect of high pressure is not proportionately as great with respect to the better absorption of water at high temperatures and thus the new result is a lower drop in pick-up when the temperature is increased from 140° F. to 200° F. than when it is increased from 80° F. to 140° F.

Figure 22 shows the effect of temperature on pick-up when six viscose rayon fabrics are padded through water. In all cases the higher the temperature the lower the pick-up. For all fabrics except the high tenacity taffeta the pick-up drop is from 10% to 15% when the temperature is raised to 200° F. from 80° F. For the high tenacity taffeta the drop in pick-up is very small, about 3%, when the temperature is raised from 80° F to 200° F.

Figure 23 shows the effect of temperature on pick-up when three acetate rayon fabrics and one nylon fabric were padded through water. In contrast to the results obtained at 91 lb. per square inch, these results at 168 lb. per square inch showed a marked drop in pick-up for the filament acetate sharkskin and the nylon oxford amounting to about 25% when the temperature was increased from 80° F. to 200° F. The acetate ninon showed a drop in pick-up of 18% when the temperature was increased from 80° F. to 140° F. and a drop in pick-up of 36% when the temperature was raised from 140° F. to 200° F. The pick-up of the spun acetate suiting decreased proportionately as the temperature was increased and totaled about the same at 168 lb. per square inch as at 91 lb. per square inch.

Effect of Temperature on Pick-Up—Padder A-273 Lb./Sq. In.

Figure 24 shows the effect of temperature on pick-up when four cotton fabrics were padded through water. In all cases, the higher the temperature the lower the pick-up. All fabrics except the plush show a drop in pick-up of about 16% when the temperature is increased from 80° F. to 200° F. The plush shows a much greater drop in pick-up, about 27%, indicating the combined effect of high temperature and high pressure on this fabric.

Figure 25 shows the effect of temperature on pick-up when six viscose rayon fabrics were padded through water. In all cases the higher the temperature the lower the pick-up. Except for the high tenacity taffeta the drop in pick-up ranged from 8% to 12% when the temperature was raised from 80° F. to 200° F. The effect of increased temperature on the pick-up of the high tenacity taffeta was small, the drop in pick-up being 4% when the temperature was increased from 80° F. to 200° F.

Figure 26 shows the effect of temperature on pick-up when three acetate rayon fabrics and one nylon fabric were padded through water. Large drops in pick-up occurred when the temperature was raised from 80° F. to 200° F. for the three acetate fabrics. The decrease in pick-up was 42% for the ninon, 18% for the sharkskin, and 30% for the suiting. The effect of temperature on the pick-up of nylon oxford was small, with no drop when the temperature was raised from 80° F. to 140° F. and only a 5% drop when the temperature was raised from 140° F. to 200° F.

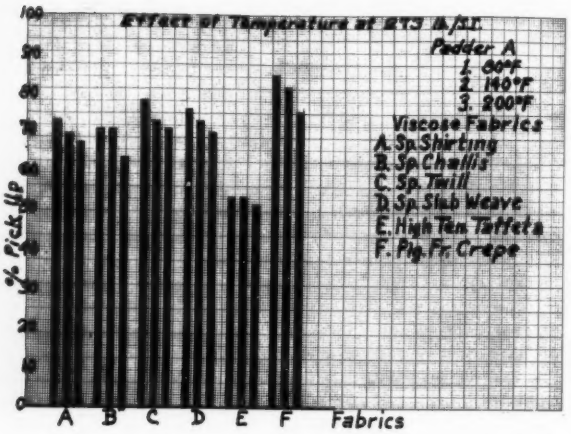
Effect of Speed

The effect of increased speed is to decrease the amount of water absorbed because of the decreased immersion time. However, increased speed tends to carry an increased amount of water through the nip by physical force. The balance between these effects is greatly influenced by the construction of a fabric. High speeds, i.e., over 90 yards per minute may mechanically carry considerable water through the nip.

Effect of Speed at 80°F. and 168 Lb./Sq. In.—Padder A

Figure 27 shows the effect of speed on pick-up of four cotton fabrics when padded through water. With all fabrics except the twill, the pick-up was lower at lower speeds. The twill exhibited a slightly greater pick-up at the lower speed.

Figure 28 shows the effect of speed on pick-up of six viscose rayon fabrics when padded through water. With all fabrics except the high tenacity taffeta, the pick-



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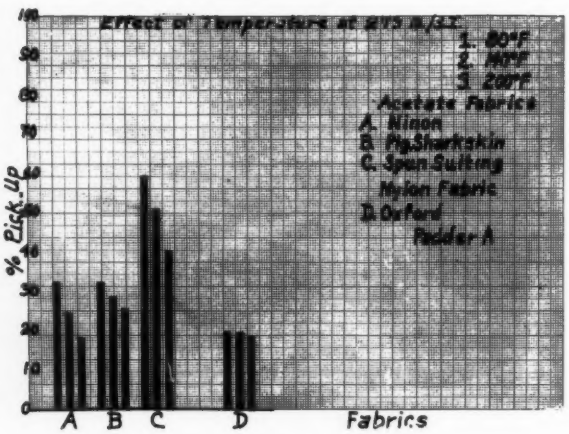

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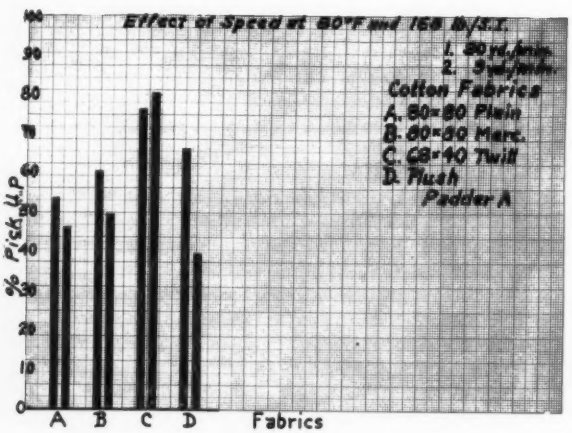

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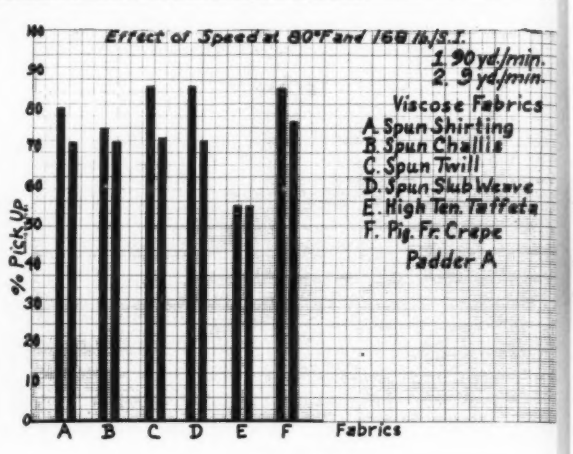

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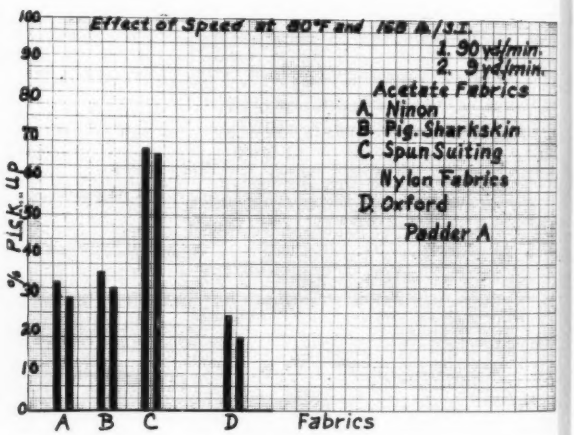

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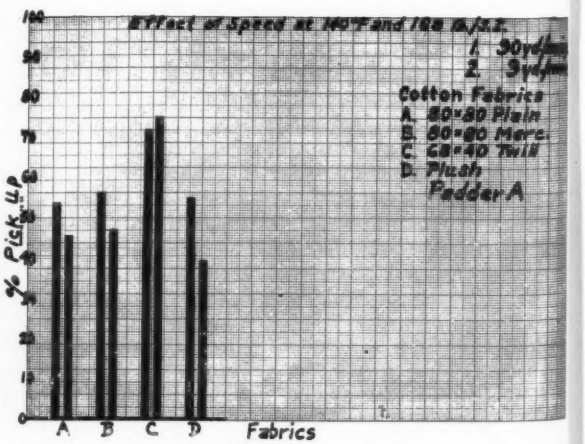

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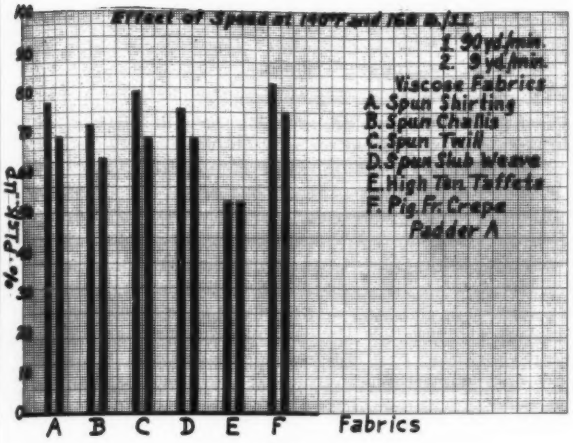

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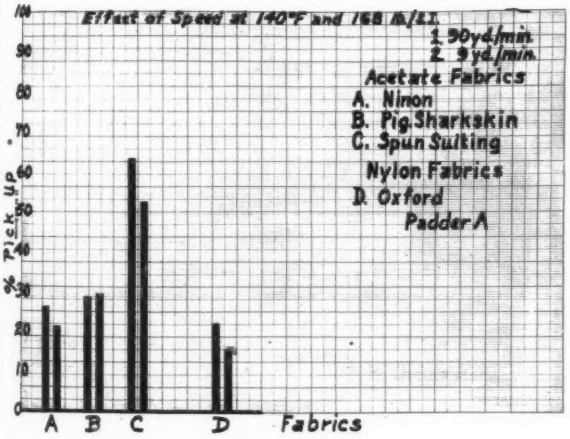

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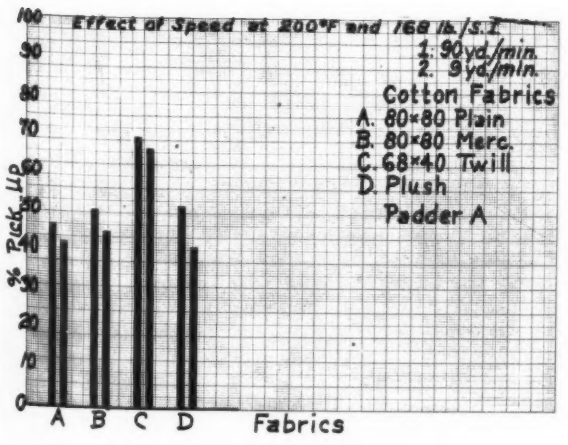

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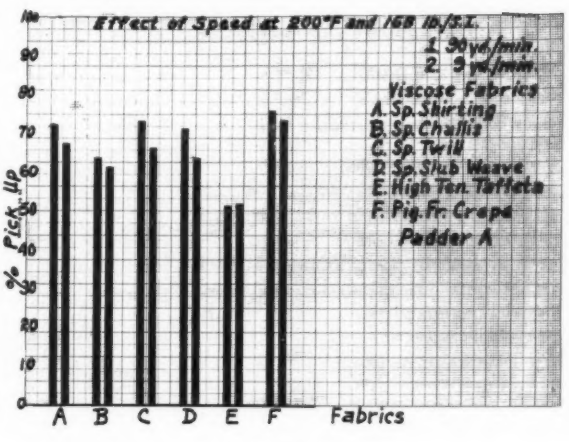

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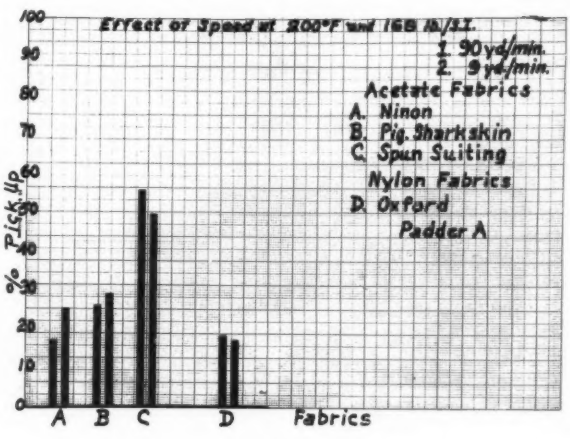

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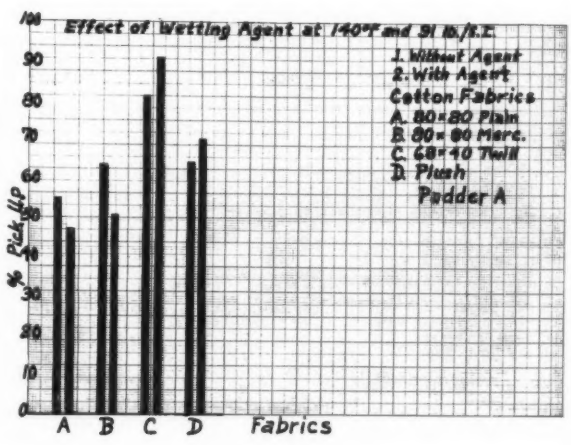

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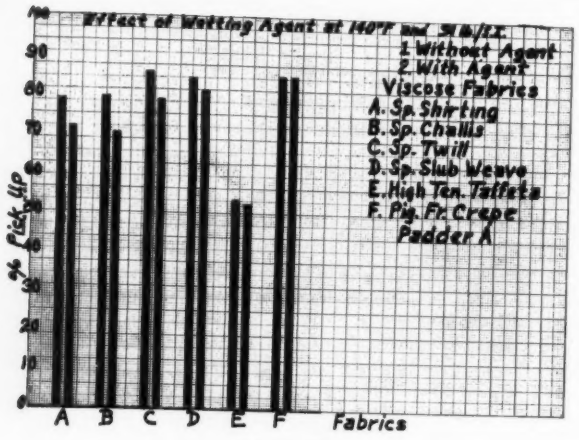

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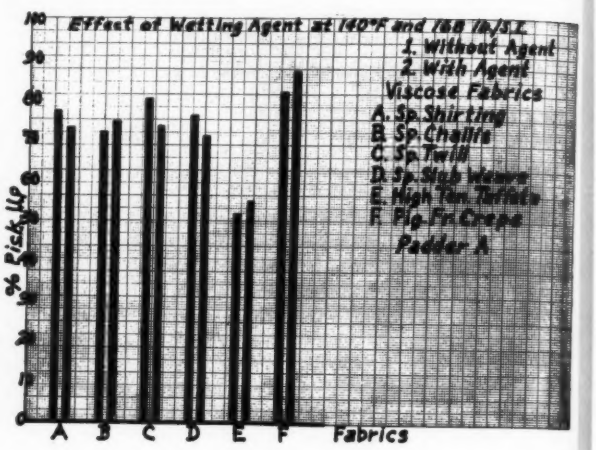

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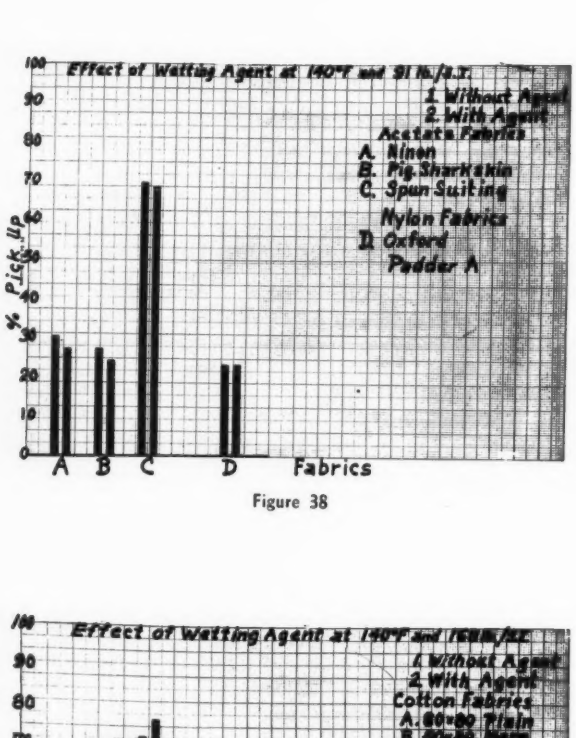

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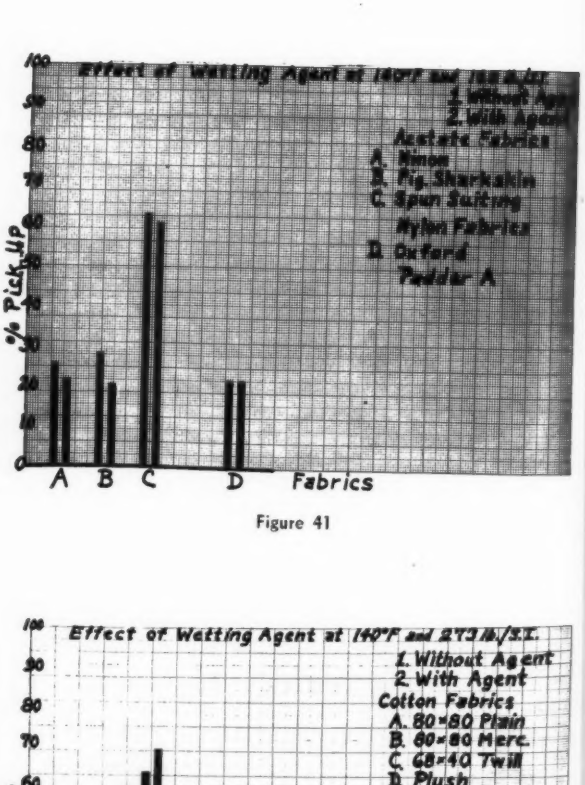

Figure 41

Figure 39

Figure 42

up was lower at lower speeds. Speed had no effect on the pick-up of the taffeta.

Figure 29 shows the effect of speed on pick-up of three acetate rayon fabrics and one nylon fabric when padded through water. In all cases, the pick-up was smaller at the lower speed.

Effect of Speed at 140° F. and 168 Lb./Sq. In.—Padder A

Figure 30 shows the effect of speed on pick-up of four cotton fabrics when padded through water. The general results are the same as described under figure 27, but the respective pick-ups are slightly less at 140° F. than at 80° F.

Figure 31 shows the effect of speed on pick-up of six viscose rayon fabrics when padded through water. The general results are the same as described under figure 28, but the respective pick-ups are less at 140° F. than at 80° F.

Figure 32 shows the effect of speed on pick-up of three acetate rayon fabrics and one nylon fabric when padded through water. For all fabrics except the filament acetate sharkskin, the pick-up was less at the lower speed. The lower speed and a temperature of 140° F. instead of 80° F. caused the sharkskin to absorb sufficient water so that a greater pick-up was obtained at 9 yards a minute than at 90 yards a minute. Probably at the usual commercial speeds, little difference in pick-up would be observed on this fabric.

Effect of Speed at 200° F. and 168 Lb./Sq. In.—Padder A

Figure 33 shows the effect of speed on pick-up when four cotton fabrics were padded through water. The general results are the same as described under figures 27 and 30, but the respective pick-ups are less at 200° F. than at 140° F. or 80° F.

Figure 34 shows the effect of speed on pick-up when six viscose rayon fabrics were padded through water. The general results are the same as described under figures 28 and 31, but the respective pick-ups are less at 200° F. than at 140° F. or 80° F.

Figure 35 shows the effect of speed on pick-up when three acetate rayon fabrics and one nylon fabric were padded through water. The ninon and the sharkskin had greater pick-ups at the lower speed due to combined effect of slow speed and high temperature which increased the absorption of water enough to overbalance the slightly better extractive effect at the low speed. The pick-up of the nylon oxford was hardly affected by speed. The spun acetate suiting had less pick-up at the lower speed.

Effect of Wetting Agents

Wetting agents may increase the absorption of water by fabrics which do not wet out readily and they may exert little effect on the absorption of water by fabrics which wet out rapidly. By their effect in reducing the surface tension of water they may increase the ease with which water is extracted from a fabric. The net effect of a wetting agent on pick-up therefore depends upon the relative magnitude of these two factors.

Effect of a Wetting Agent at 140° F. and 91 Lb./Sq. In.—Padder A

Figure 36 shows the effect of a wetting agent on pick-up of four cotton fabrics when padded through a water solution of the agent. The pick-up was decreased in the presence of the agent in the case of the two easy-to-wet-out fabrics, the plain and the mercerized print cloths. The fabrics which did not wet out as rapidly, the twill and the plush, showed more pick-up in the presence of the wetting agent.

Figure 37 shows the effect of a wetting agent on the pick-up of six viscose rayon fabrics when padded through a water solution of the agent. The pick-up decreased when the four spun viscose and easy-to-wet-out fabrics were padded in the presence of the wetting agent. The wetting agent exerted little effect on the pick-up of the high tenacity taffeta and the pigmented French crepe.

Figure 38 shows the effect of a wetting agent on the pick-up of three acetate rayon fabrics and one nylon fabric when padded through a water solution. The acetate ninon and the acetate sharkskin had about 12% less pick-up in the presence of the wetting agent. The wetting agent had little effect on the pick-up of the spun acetate suiting or the nylon oxford.

Effect of a Wetting Agent at 140° F. and 168 Lb./Sq. In.—Padder A

Figure 39 shows the effect of a wetting agent on the pick-up of four cotton fabrics when padded through a water solution of the agent. The general results are the same as described under Figure 36 but the respective pick-ups are less at 168 lb./sq. in. than at 91 lb./sq. in.

Figure 40 shows the effect of a wetting agent on the pick-up when six viscose rayon fabrics were padded through a water solution. The general results are the same as described under Figure 37 but the respective pick-ups are less at 168 lb./sq. in. than at 91 lb./sq. in.

Figure 41 shows the effect of a wetting agent on the pick-up of three acetate rayon fabrics and one nylon fabric when padded through a water solution of the agent. The acetate ninon had 16% less pick-up and the acetate sharkskin 26% less pick-up which was respectively about 1½ and 2½ times as great as at the lower pressure of 91 lbs./sq. in. used in Figure 38. The spun acetate suiting and the nylon showed little difference in pick-up when the wetting agent was used.

Effect of a Wetting Agent at 140° F. and 273 Lb./Sq. In.—Padder A

Figure 42 shows the effect of a wetting agent on the pick-up of four cotton fabrics when padded through a water solution of the agent. The general results are the same as described under Figures 36 and 39, but high pressure decreased the magnitude of the effect of a wetting agent.

Figure 43 shows the effect of a wetting agent on the pick-up of six viscose rayon fabrics when padded through a water solution of the agent. The high pressure greatly decreased the effect of the wetting agent.

Figure 44 shows the effect of a wetting agent or the pick-up of three acetate rayon fabrics and one nylon fabric, when padded through a water solution of the agent. The acetate ninon had 8% less pick-up the acetate sharkskin 28% less pick-up. and the nylon oxford was unaffected when padded in the solution of the wetting agent. The spun acetate suiting had 18% greater pick-up when padded in the presence of the wetting agent.

DATA

Padders

PADDER A

Upper roll-rubber-Shore Durometer 85—20" diameter No Crown
Lower roll—stainless steel 20" diameter ¾" Thickness Rubber Covering
Length of roll = 55"

Applied	3 Tons	6 Tons	12 Tons
lb./linear inch	109	218	436
lb./square inch	91	168	273
width of nip	1.2"	1.3"	1.6"

Immersion length from liquor contact to nip = 25½"
Immersion time at 90 yards per minute = 0.47 seconds.
Immersion time at 9 yards per minute = 4.7 seconds.

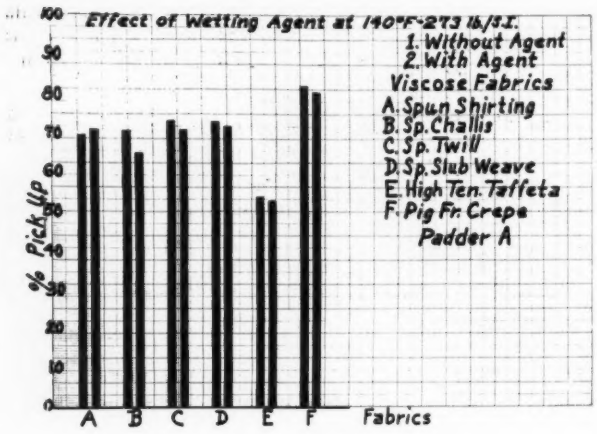

Figure 43

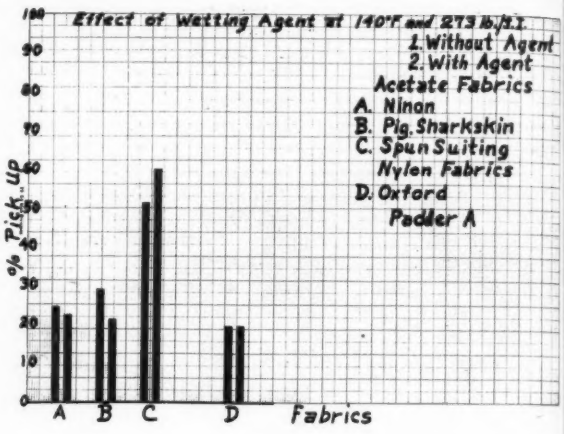

Figure 44

PADDER B

Upper roll-rubber-Shore Durometer 83-20″ diameter .5/1000″ Crown on Top Roll
Lower roll-rubber-Shore Durometer 100-20″ diameter ¾″ Thickness Rubber Covering
Length of rolls = 65″

Applied Load	2 Tons	4 Tons	6 Tons	8 Tons	12 Tons
lb./linear inch	62	124	186	248	372
lb./square inch	103	113	143	165	219
width of nip	0.6″	1.1″	1.3″	1.5″	1.7″

Immersion length from liquor contact to nip = 41¾″ No Crown
Immersion time at 90 yards per minute = 0.76 seconds ¾″ Thickness of Rubber Covering
Immersion time at 25 yards per minute = 2.74 seconds.

PADDER C

Lower roll-rubber-Shore Durometer 73—12″ diameter Top Roll No Crown
16″ diameter Bottom Roll ¾″ Thickness Rubber Covering
Length of rolls = 70″

Applied Load	2 Tons	2 Tons	6 Tons	8 Tons	11 Tons
lb./linear inch	57	114	171	228	214
lb./square inch	48	81	114	143	185
width of nip	1.2″	1.4″	1.5″	1.6″	1.7″

PADDER D

Upper roll-rubber-Shore Durometer 90-18″ diameter No Crown
Lower roll-rubber-Shore Durometer 100-18″ diameter ⅝″ Rubber Covering
Length of rolls = 66″

Applied Load	3 Tons	6 Tons	9 Tons	12 Tons
lb./linear inch	91	182	273	364
lb./square inch	114	202	273	331
Width of nip	0.8″	0.9″	1.0″	1.1″

Immersion length from liquor contact to nip = 35⅛″
Immersion time at 110 yards/minute = 0.35 seconds.
Immersion time at 90 yards/minute = 0.17 seconds.

The hardness of the rubber rolls was measured with the Shore Durometer. The following chart shows the relationship between three common systems used to determine hardness of rubber rolls.

Hardness of Rubber Rolls

Shore Durometer	P. & J. Plastometer ½″ Roll	Adams Densimeter	Numerical Trade Rating
100	0	0	
98	5–15	2–5	5¾
95	15–20	5–7	5½
90	30	12	
88	32	13	5¼
85	36	14	
82	40	16	5
80	44	22	
75	52	26	4⅞
71	62	31	4¾
70	64	32	
67	70	35	4½
65	76	38	
63	80	40	4
60	90	45	3
55	106	53	
54	110	55	2½
50	124	62	
43	160	80	2
42	170	85	1
40	175	88	
30	250	125	0

Fabrics

Cotton Print Cloth

80 x 80—4 yards/lb.—30″ grey width—kier boiled and bleached—unmercerized.

Cotton Print Cloth

80 x 80—4 yards/lb.—30″ grey width—kier boiled, bleached and mercerized.

Cotton Twill

68 x 40—2.50 yards/lb.—40″ grey width—kier boiled and bleached—unmercerized.

Cotton Plush

Pile: 20/2KP cotton. Ground: 20/2KP cotton. Picks: 29.

Pile height: 12/64″. Width 54″ Weight 18.7 oz. per lineal yard.

Viscose Shirting

Warp: 2 ply spun viscose. Filling: 2 ply spun viscose.

Greige count: 88 x 66. Raw weight 28.5 lb./100 yards.

Raw width: 40¾″.

Viscose Twill

Spun viscose warp and filling. Warp: 130. Filling: 60.

Viscose Challis

66 x 38. Weight: 26.5 lb./100 yards. 40″ wide.

Warp: 25/1 cotton count spun viscose. Filling: 17/1 cotton count spun viscose.

Slub Viscose

Spun viscose ply yarns warp and filling. Warp: 30. Filling: 30.

High Tenacity Taffeta
Pigmented Viscose French Crepe

92 x 68. Weight: 18 lb./100 yards. Width: 40. Warp: 100 denier filament.

Filling: 150 denier filament.

Bemberg Sheer

104 x 72. Weight 15 lb./100 yards. Warp: 75 denier S and Z twist, 2 x 2. Filling: 75 denier. Width: 44".

Acetate Ninon

Acetate warp and filling.

Acetate Sharkskin

Pigmented acetate, 300 and 600 denier. Warp: filament acetate. Filling: filament acetate. Raw weight: 51.9 lb./100 yards. Raw width: 43¾". Raw count: 96 ends x 38 picks.

Spun Acetate Suiting

14/2 spun acetate, bright staple. Warp and filling: spun acetate, 2 ply. Raw weight: 54.2 lb./100 yards. Raw width: 52½". Raw count: 32 ends x 30 picks.

Nylon Oxford

Warp: filament nylon. Filling: filament nylon. Raw weight: 20.1 lb./100 yards. Raw width: 40". Greige count: 92 x 72.

Pick-Up Measurement

Pieces of each fabric, 42" long and 18" wide, with lines marked across the piece 3" from each end, were sewn together and wound into rolls. A roll was padded under the desired conditions and batched up at the rear of the padder. As fast as the roll was unwound by hand, 36" long pieces were quickly cut off and immediately weighed to the nearest 0.1 gram on an Ohans balance adjacent to the batcher. The original weight of each piece of fabric was previously determined on cloth conditioned at 70°F. and 65% relative humidity. While objection may be raised to this procedure, check tests and experience indicated it was sufficiently accurate for the purposes of this preliminary investigation of the subject of a pick-up.

General Conclusion

The outstanding fact established by this preliminary investigation is the relationship of eleven factors which are involved in the results which the textile trade calls "pick-up." In the absence of a clear understanding of these factors, and prior to the existence of experimental data, experienced textile men can easily give the wrong answer in specific cases to such questions as:

1. Is pick-up greater at high speeds or at low speeds?
2. Is pick-up greater at high temperatures or at low temperatures?
3. Is power input increased or decreased with variations in speed or rubber density?

We feel that these questions, and others, have been answered by this paper.

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(Continued from Page P158)

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(Continued on Page P183)

Non-Cellulosic Fibers Group Meeting—

APPLICATION OF LEUCOESTERS OF VAT DYESTUFFS TO WOOL*

DR. HANS LUTTRINGHAUS
General Dyestuff Corporation

THE leucoesters of vat dyestuffs are stable water soluble products, which exhaust on the fiber from neutral or acid baths. The color of the original vat dye from which the leucoester was derived is developed on the fiber by oxidizing agents in the presence of acid.

The cotton dyer and printer has used the leucoesters of vat dyestuffs for many years under the name of Indigosols or Algosols. Recently some are also manufactured under the name of Calco Soluble Vats. With higher demands for fastness to washing and light for wool goods, shrink-resistant wool in particular, leucoesters begin to find increased interest among woolen and worsted manufacturers.

However, the Algosols are not very familiar to most wool dyers, and the cotton dyers and printers who know the products thoroughly will be faced with entirely different problems when they apply the Algosols to wool.

Therefore we feel that the information and experience which we have gathered over the years might be of interest for many of you.

History and Chemistry

Leucoesters were first manufactured in 1922. According to the invention of Marcel Bader, vat colors undergo a sulfation with chloro-sulfonic acid in the presence of pyridine, resulting in the conversion of a hydroxyl derivative to an ester of sulfuric acid. Thus the leucoderivative of a vat color is made into a relatively stable, water-soluble leucoester. The simplest example is the change of Indigo into Indigosol O or Algosol Blue O (Figure 1).

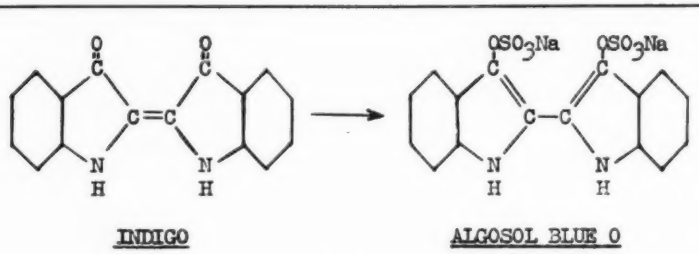
Algosol Blue O is, therefore, the sodium salt of the disulfated acid ester of leucoindigo. This product is colorless and water-soluble. Similarly, the other Algosols are disulfated acid esters of the corresponding vat colors given below.

Parent Vat Color	*Algosol*
Indigo	Algosol Blue O
Dibromo Indigo	Algosol Blue OR
Brilliant Indigo 4B (Tetrabromo)	Algosol Blue O4B
Hexabromo Indigo	Algosol Blue O6B
Indanthrene Blue BCSA	Algosol Blue IBC
Indanthrene Printing Blue GG	Algosol Printing Blue IGG
Indanthrene Brown BRA	Algosol Brown IBR
Indanthrene Brown RRA	Algosol Brown IRRD
Indanthrene Golden Yellow GKA	Algosol Golden Yellow IGK
Indanthrene Golden Yellow RKA	Algosol Golden Yellow IRK
Indanthrene Brilliant Green BN	Algosol Green IBW
Algol Orange RFA	Algosol Orange HR
Indanthrene Brilliant Pink RA	Algosol Pink IR Extra
Indanthrene Red FBBA	Algosol Red IFBB
Indanthrene Red Violet RHA	Algosol Red Violet IRH
Indanthrene Brilliant Orange RKA	Algosol Brilliant Orange IRKL
Indanthrene Brilliant Pink 3B	Algosol Brilliant Pink I3B
Indanthrene Brilliant Violet 4RA	Algosol Brilliant Violet I4R
Helindon Yellow CG	Algosol Yellow HCG
Indanthrene Printing Black BL Base	Algosol Grey IBL
Indanthrene Olive Green BA	Algosol Olive Green IB
Indanthrene Scarlet B	Algosol Scarlet IB

One exception is Algosol Blue IBC, which is the tetraester of Indanthrene Blue BCSA. For some Indanthrenes it is necessary to produce the tetraester, as the solubility and stability of the diester are not sufficient.

Stability

The stability of the unstandardized leucoesters is relatively good and varies with the different types. If oxidation occurs for any reason, as by the action of light or acid fumes in the air, a local decomposition is initiated. Through this decomposition a small amount of free acid is liberated which again decomposes the next particles until the whole mass is oxidized. To prevent this autodecomposition, the Algosols are standardized with alkaline salts. These alkaline buffers assure a stability which is sufficient for practical use.



INDIGO — ALGOSOL BLUE O

Figure 1

*Presented at Non-Cellulosic Fibers Group Meeting, Augusta National Convention, October 22, 1948.

Solubility

The sodium salts of the different leucoesters vary considerably in solubility. Algosol Blue O is very soluble in water; the derivatives of the halogenated indigos are less soluble, according to the degree of halogenation. Although a consideration of the solubility of the Algosols is of great importance to the printer because products of lesser solubility might cause trouble in concentrated printing pastes, the wool dyer will have no trouble at all, since the solubility of the Algosols surpasses, in most cases, the solubility of the regular acid or chrome dyestuffs. The Algosols are thus simply dissolved in hot water. Boiling is not only unnecessary but should be avoided to prevent premature oxidation.

Affinity for Cotton and Wool

These water-soluble Algosols have much more affinity for animal fibers, such as wool, than they do for the vegetable fibers, such as cotton. Furthermore, the means normally employed by the dyer to control affinity have a very different effect on Algosols when wool is being dyed than when cotton is being dyed. Raising the temperature increases the affinity of Algosols for wool but decreases it for cotton. The cotton dyer must either use Algosols of similar affinity in the same bath or take special precautions; the wool dyer, on the other hand, can easily minimize differences in affinity.

In their dyeing behavior toward wool, the Algosols really resemble the acid dyes considerably. For example, the rate of exhaustion is increased by the addition of acid and by increasing the temperature. In the use of acid for the exhaustion of Algosols on wool, the kind and amount of acid must be given careful consideration to avoid unlevelness, just as with acid dyestuffs. Since the Algosols behave like acid dyes, they are fixed on the fiber chemically and possess good fastness to washing on wool in their colorless leuco state. I have here (samples shown) a representative each of the indigoids and anthraquinones, Algosol Pink IR Supra and Algosol Olive Green IB. The dyeing below is the original, the one at the left has been washed before development according to the AATCC wash test #1 for wool and the other at the right according to AATCC wash test #2 for wool. They were developed after the wash test was completed. While you can notice a loss in depth especially after wash test #2 in the case of Algosol Pink IR Supra, this test proves that a thorough fixation of leucoesters on wool occurs even before development. This fixation is probably the reason that Algosols on wool are much more difficult to oxidize than on cotton.

It is known that the Algosols are very sensitive to acid. Why is it then that they can be boiled in an acid bath without oxidation? Algosol Blue O can even be boiled with mineral acid. The reason is that most of the dyestuff is exhausted and fixed on the wool shortly after boiling and as soon as the sulfogroup is engaged by the wool, oxidation is retarded.

Dyeing of Algosol Blue O

Many a wool dyer became acquainted with Algosol Blue O during the war. If you look through all text books and hand books and circulars you will find that Algosol Blue O is to be dyed with Glauber's salt, Rongalite, acetic acid or formic acid, and after boiling for one-half hour it is to be exhausted with sulfuric acid. We must say that this information given in all books including ours is wrong for the reasons which follow.

Figure 2 shows the exhaustion curve if the dyeing is carried out according to this procedure. Figure 2 shows also the exhaustion curve if the dyeing is carried out with 3% sulfuric acid and Glauber's salt. You see that acetic acid exhausts a dyebath with Algosol Blue O very incompletely, only to about 55%. On the other hand, the exhaustion with sulfuric acid is very fast at 130° to 160° and is almost complete by the time the dyebath reaches 200°F. That means any addition of sulfuric acid after boiling one-half hour with acetic acid will force the exhaustion of the remaining high amount of Algosol so rapidly that the possibility of unevenness is very great. However, if sulfuric acid is used from the beginning of the dyeing operation we can obtain a slow and even exhaustion if we raise the temperature slowly up to 170°F. That is the reason why we have always dyed Algosol Blue O on piece goods with stronger acids than acetic acid. This method also produces dyeings faster to crocking as any oxidation of unexhausted dyestuff is largely eliminated.

Developing of Algosol Blue O

Algosol Blue O and OR are the only products that are developed on wool with sodium nitrite and sulfuric acid at room temperature. The developing is at least one-half hour in contradistinction to cotton where the oxidation is extremely fast. The reason for the slow oxidation on wool was explained before.

Dyeing of Algosols

Today we are more concerned with the behavior of the other Algosols. We have studied their exhaustion properties on wool at a pH of 7 and have made the interesting observation that many of them exhaust almost completely if the dyebath is adjusted at a pH of 7. The high-molecular anthraquinone types show the best exhaustion at the neutral point. The indigoids show much less exhaustion, but

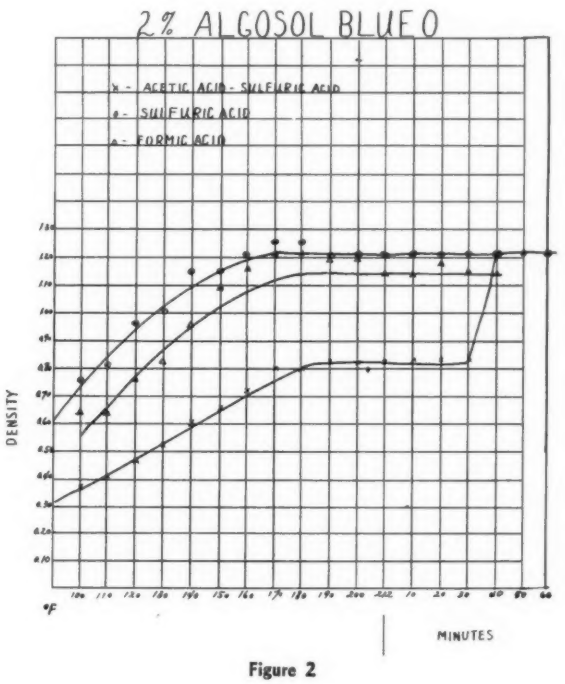


Figure 2

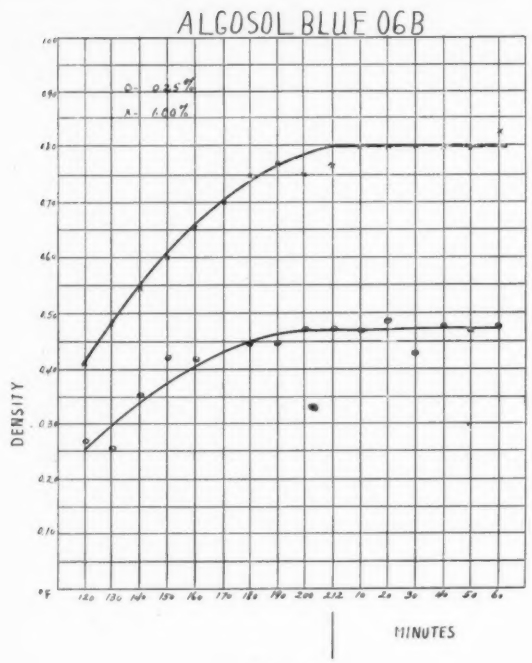


Figure 3

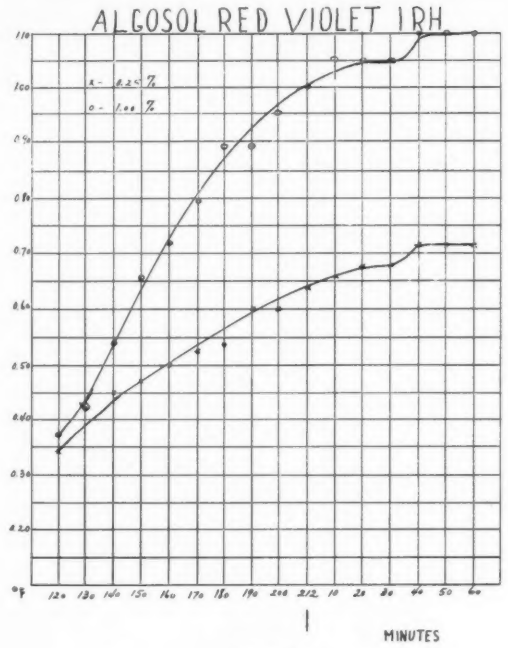


Figure 5

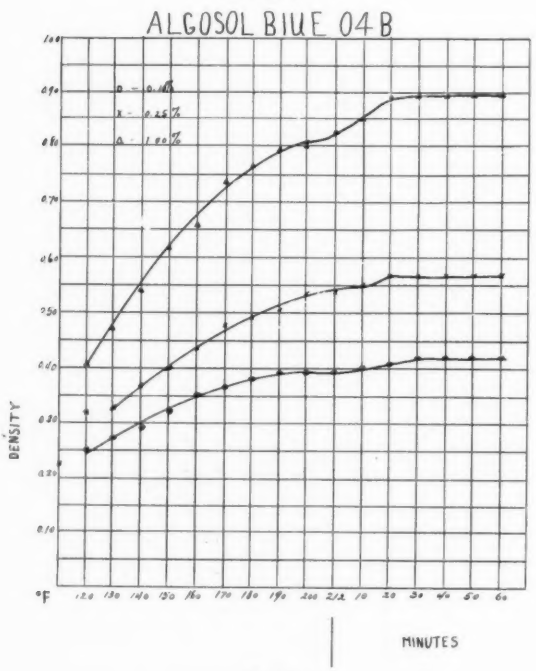


Figure 4

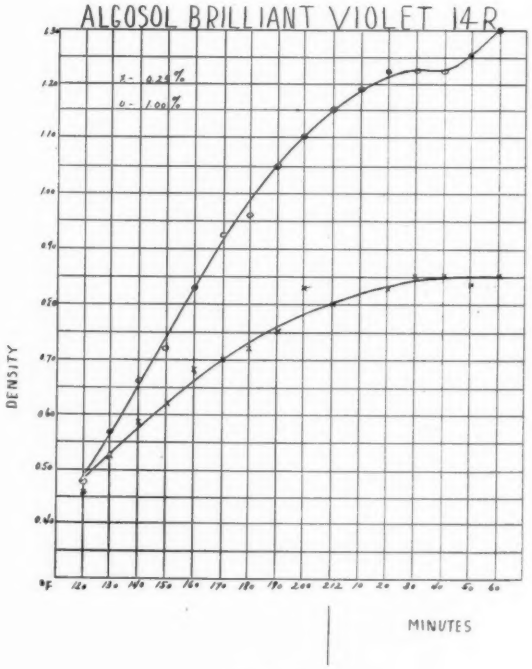


Figure 6

with increasing introduction of negative halogene atoms in the molecule the indigoids and thioindigoids show better exhaustion. If, therefore, Algosol Golden Yellow IGK is brominated, we obtain Algosol Golden Yellow IRK with better exhausting properties. If we introduce just one more chlorine into the molecule of Algosol Pink IR Supra, we obtain Algosol Brilliant Pink I3B which thus possesses much be ter exhausting properties.

Practical Dyeing Methods

To obtain good exhaustion, it would be impractical for the dyer to adjust the dyebath to a certain pH. Moreover, a pH of 7 throughout the entire dyeing operation does not produce the best all-round conditions for the dyeing of Algosols. Therefore the addition of 2 to 10% of ammonium sulfate is recommended. If necessary, the dyebath is exhausted with acetic acid.

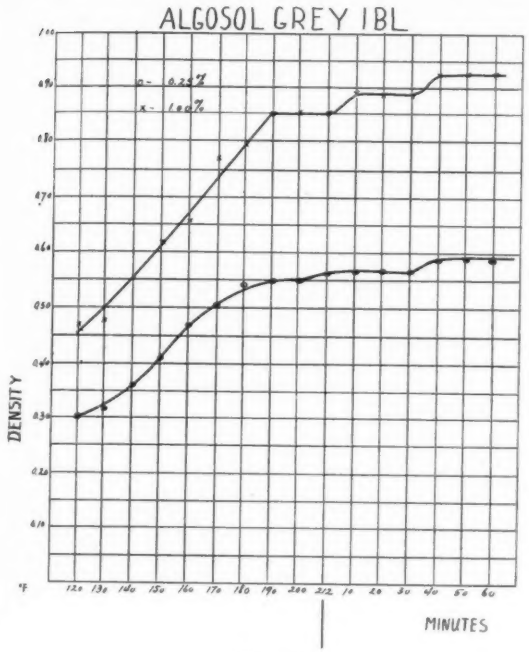


Figure 7

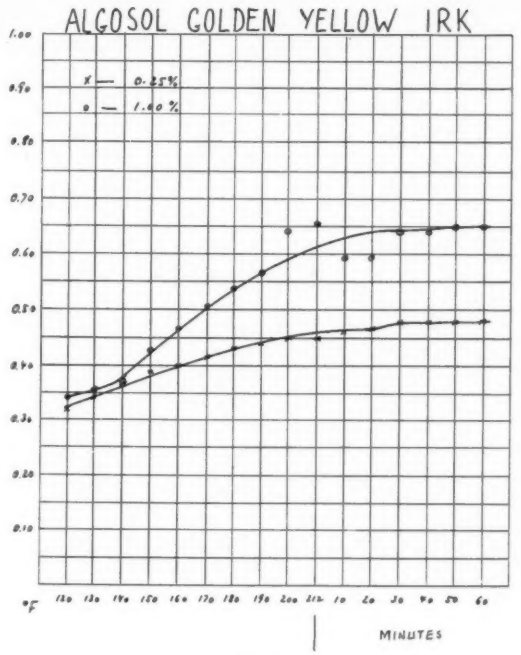


Figure 9

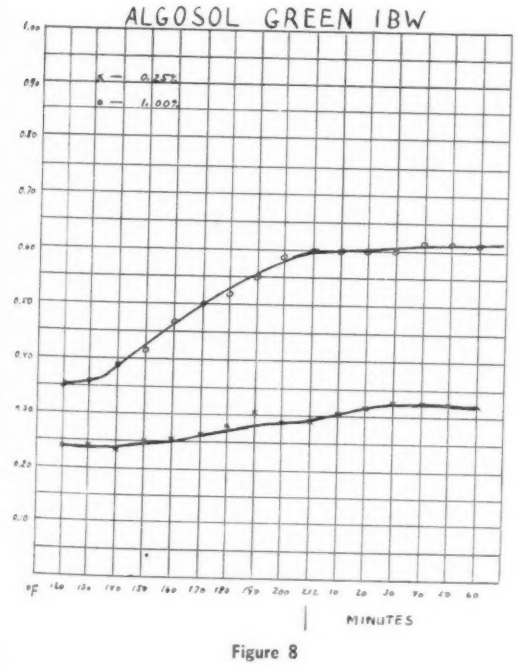


Figure 8

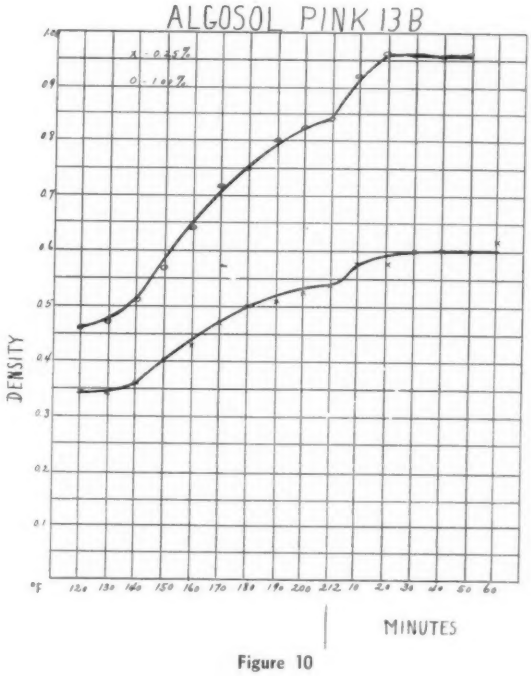


Figure 10

The dyer knows from his everyday experience that combinations of acid or chrome dyes exhaust at different speeds and at different rates. It is easy to see when a blue exhausts first, followed by a yellow, while a red remains in the bath. When dyeing Algosols this cannot be seen, either because the leuco-compound is white, as the name indicates, or because it has a different shade from the oxidized product. To make it possible for all those who work with Algosols to understand their exhausting properties, we have studied the exhaustion of all important Algosols. The tests were made in such a way that dyeings were taken out at 120°, 130°, 140° and at every 10-degree interval up to the boil, and thereafter at every 10 minutes interval for 60 minutes after the boil. The time from 120°F. to the boil was approximately one hour. After development the reflections of all dyeings were measured with the Photovolt meter, which works quickly and efficiently

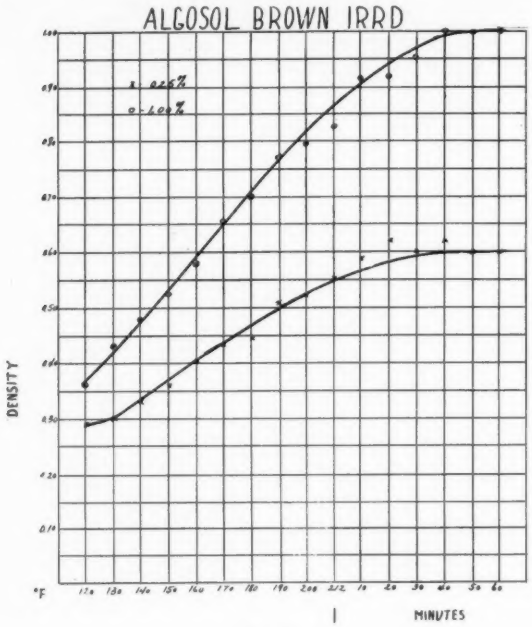


Figure 11

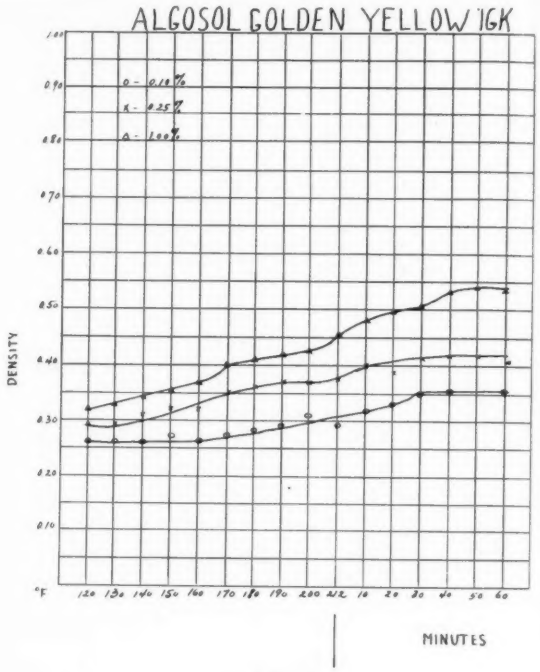


Figure 13

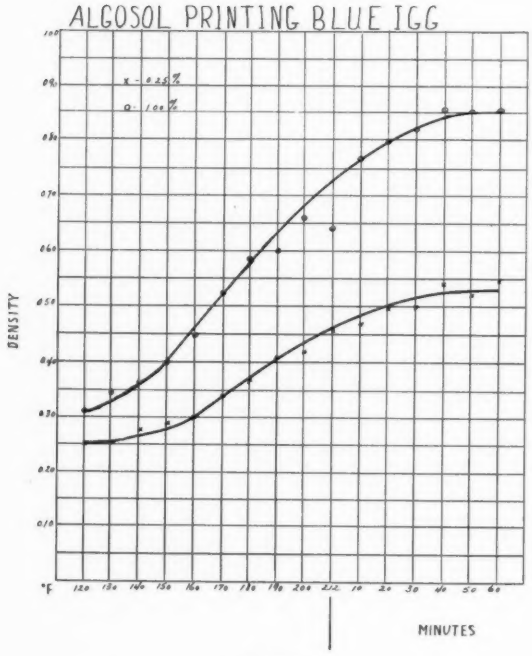


Figure 12

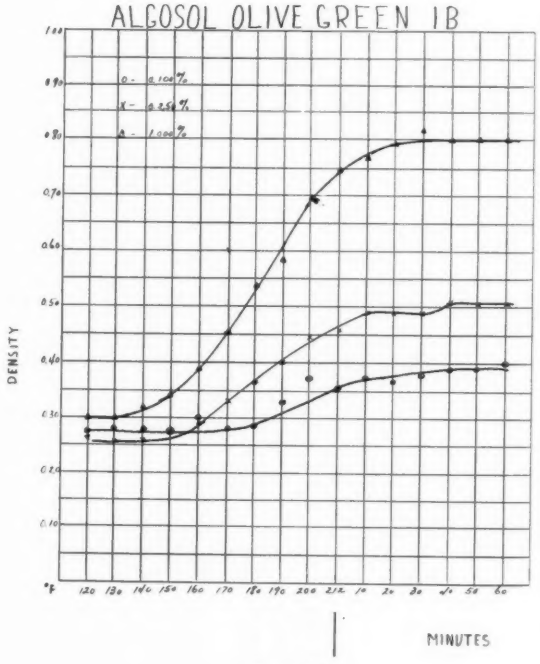


Figure 14

enough for the purpose. An exhaust dyeing was made from each dye liquor, since it is not feasible to measure the density of the dyebath. Even with dispersing agents the danger exists that a dyebath containing a high amount of unexhausted leucoester may precipitate after the bath is oxidized for a measurement of density. Thus for each dyestuff 32 reflection measurements were made, 16 for the dyeings at the indicated intervals and 16 for the corresponding exhausts.

Although we actually measured the reflection values, we preferred to recalculate the values to express our curves in density. The density is the negative logarithm of the reflection expressed as a decimal. The density corresponds approximately to the depth of shade. The higher the density the deeper the dyeing. The increasing curves show, therefore, the rate of increase

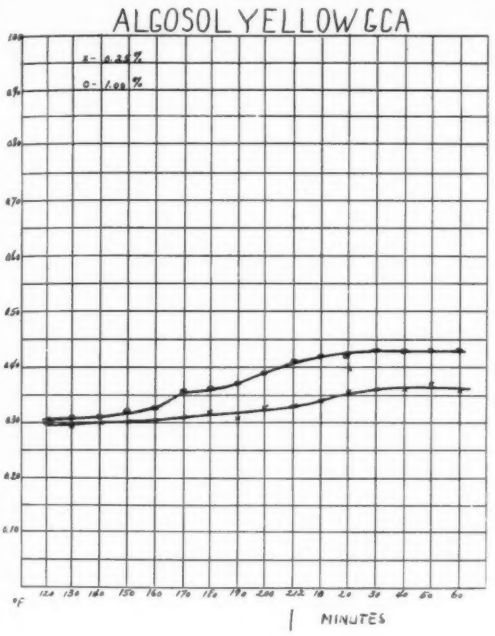


Figure 15

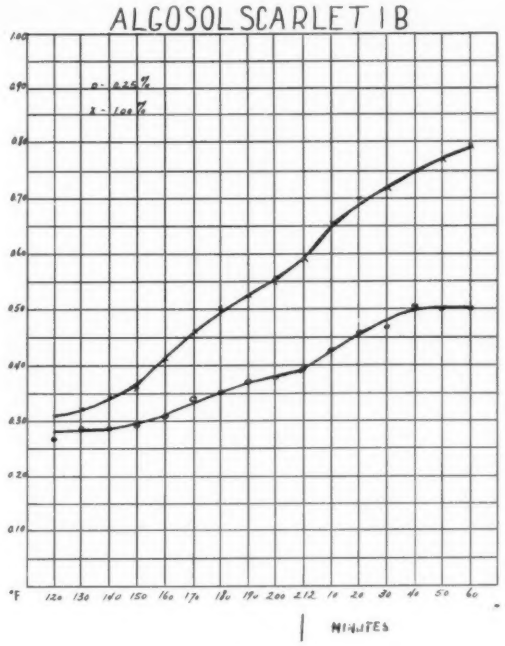


Figure 17

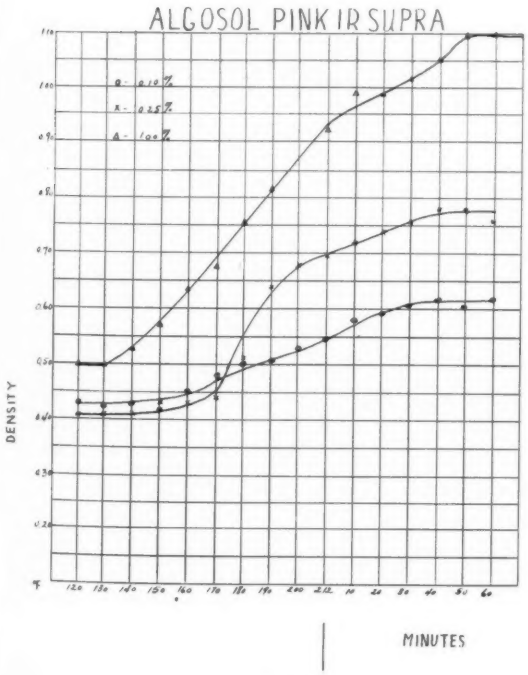


Figure 16

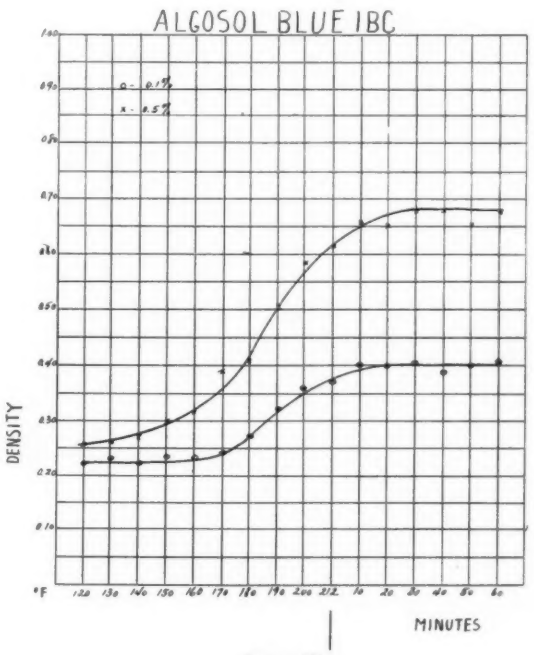


Figure 18

of depth.

In order to have a direct comparison between the exhaustion of all Algosols we kept the dyeing method the same. They were all dyed with 5% ammonium sulfate and 10% Glauber's salt. The time up to the boil was approximately 60 minutes, and the boiling was continued for 30 minutes. Then 3% acetic acid (28%) were added, and the bath was exhausted by boiling for 30 minutes. It is to be understood that 16 dyeings were run with each Algosol; but only one was carried to completion, because the other dyeings were removed at 10 degree and then 10 minute intervals. We are giving herewith the exhaustion curves of all important Algosols. (See Figures 3 to 21.)

Figure 22 shows the exhaustion curve for a 0.1% dyeing of Algosol Red IFBB and the corresponding curve for dyeings made from the exhaust baths. We do not obtain such perfectly corresponding curves with all products, especially not with types

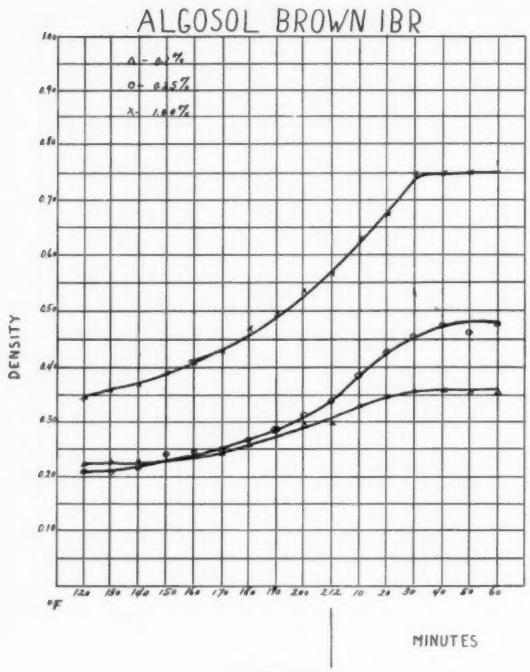


Figure 19

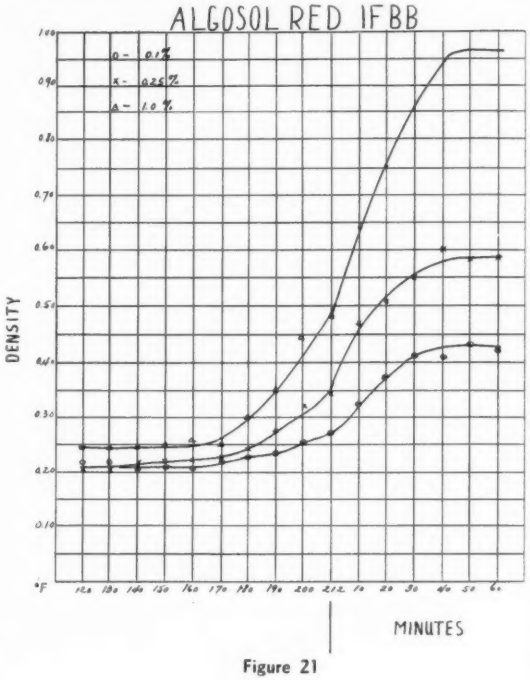


Figure 21

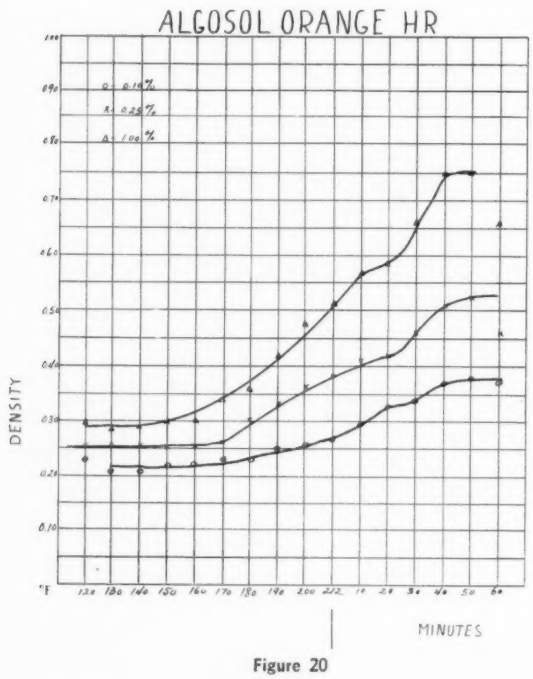


Figure 20

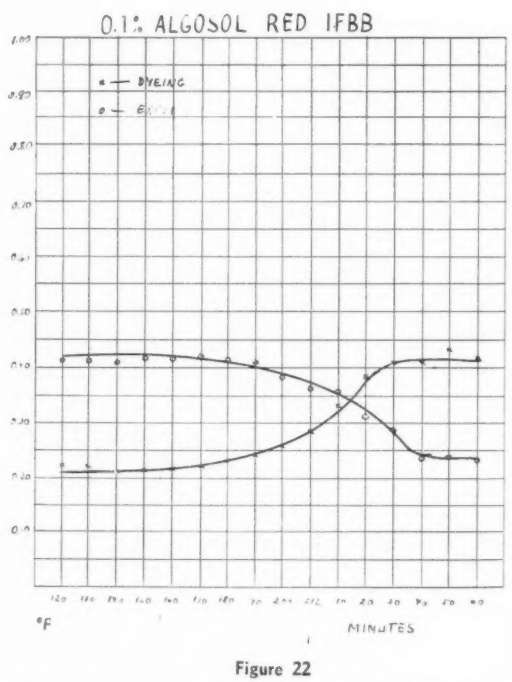


Figure 22

that are easily oxidized like Algosol Green IBW.

Figure 23 shows the exhaustion curve of 1% Algosol Red IFBB. The exhaust at 120°F. is nil. Nevertheless, we show an optical reflection density of 0.24. The reason for this is to be found in the self color of the wool, and the deposit of chrome salt on the wool, during the oxidizing process. We see that Algosol Red IFBB shows practically no exhaust below 170°F. The exhaust is steadily increasing and is completed after a 40-minute boil.

The point of completed exhaustion has a reflection density of 0.96. If we mark on the right side of Figure 23 the exhaust in percent, using the start of the dyeing operation as the zero point and the completed dyeing operation as 100% exhaust, we can determine the percent exhaust for each temperature and for any time after boiling. Thus we can say that at 200°F. Algosol Red IFBB has exhausted approxi-

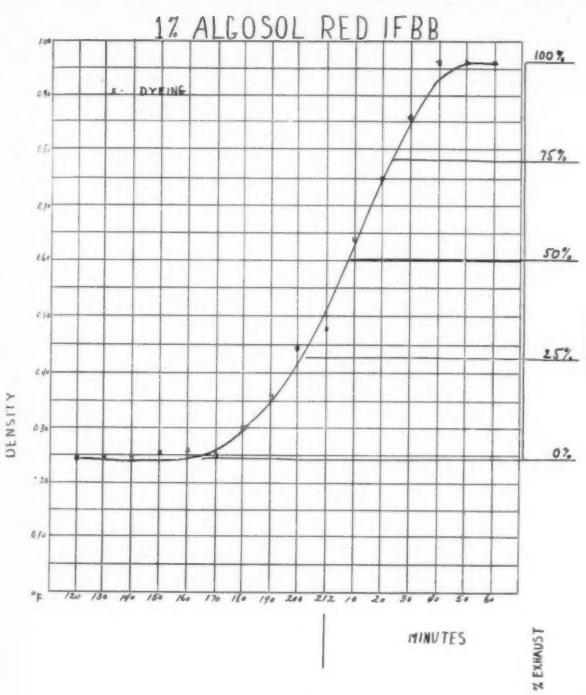


Figure 23

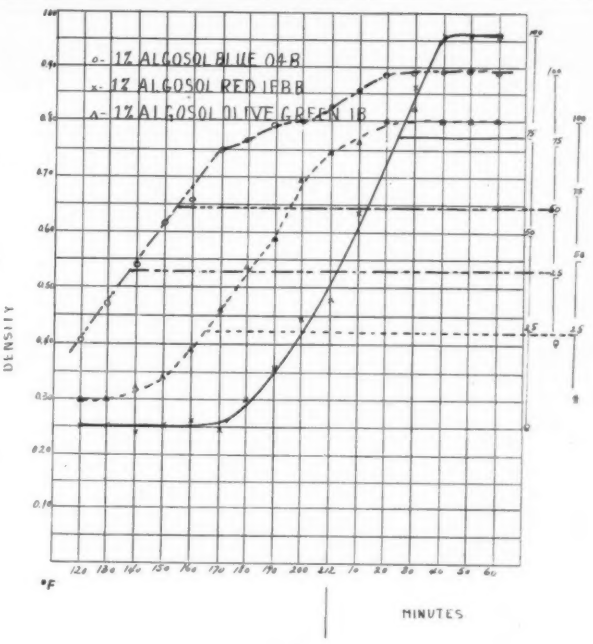


Figure 24

mately 25%, while we have a 50% exhaust after a 10-minute boil and a 100% exhaust after 40 minutes at the boil. Studying the exhaustion of all Algosols at different concentrations, we find that an Algosol which shows a characteristic curve at a certain temperature or a range of temperatures for a 0.1% dyeing, shows the same characteristics for a 1% dyeing.

The degree of exhaustion in percent is approximately the same for different concentrations at the same intervals of temperature and boiling time.

From our curves we can, therefore, set up a table for all Algosols which shows the rate of exhaustion in percent at all temperatures and boiling times. (Figure 25.)

If you want to dye Algosols on wool, it will be advisable to consult these curves or the table. They will tell you at what temperature you should start the dyeing operation, or which dyestuffs exhaust at entirely different temperatures, or which at approximately the same temperatures and time intervals. Our curves are of course valid only for neutral wool to be dyed with ammonium sulfate.

Influence of pH on Exhaustion

Variations in pH of the bath can influence exhaustion to a large degree. During mill runs we found that batches which had retained ammonia from the scouring did not exhaust as they should according

EXHAUSTION	0%	25%	50%	75%	100%
Algosol Blue O6B	120°F.*	134°F.	150°F.	170°F.	212°F.
Algosol Blue O4B	120°F.*	137°F.	156°F.	178°F.	boil 20 min.
Algosol Red Violet IRH	120°F.*	142°F.	160°F.	190°F.	boil 40 min.
Algosol Brilliant Violet 4R	120°F.*	142°F.	162°F.	187°F.	boil 20 min.
Algosol Grey IBL	120°F.*	145°F.	162°F.	182°F.	boil 40 min.
Algosol Green IBW	120°F.	150°F.	165°F.	190°F.	boil 40 min.
Algosol Gold. Yellow IRK	120°F.	150°F.	167°F.	195°F.	boil 30 min.
Algosol Pink I3B	120°F.	150°F.	170°F.	200°F.	boil 20 min.
Algosol Brilliant Orange IRKL	110°F.	140°F.	170°F.	200°F.	boil 20 min.
Algosol Brown IRRD	120°F.*	150°F.	175°F.	205°F.	boil 30 min.
Algosol Prtg. Blue IGG	120°F.	157°F.	180°F.	210°F.	boil 40 min.
Algosol Golden Yellow IGK	120°F.	160°F.	200°F.	boil 10 m.	boil 40 min.
Algosol Olive Green IB	130°F.	165°F.	182°F.	198°F.	boil 20 min.
Algosol Yellow GCA	120°F.	165°F.	185°F.	205°F.	boil 30 min.
Algosol Pink IR	130°F.	165°F.	185°F.	boil 5 m.	boil 50 min.
Algosol Scarlet IB	120°F.	165°F.	200°F.	boil 15 m.	boil 60 min.
Algosol Blue IBC	130°F.	170°F.	185°F.	200°F.	boil 20 min.
Algosol Brown IBR	120°F.	175°F.	205°F.	boil 15 m.	boil 30 min.
Algosol Orange HR	160°F.	187°F.	208°F.	boil 20 m.	boil 40 min.
Algosol Red IFBB	160°F.	198°F.	boil 5 m.	boil 25 m.	boil 40 min.
Algosol Blue O (acetic acid)	120°F.	135°F.	175°F.	boil 30 m.	boil 40 min.
Algosol Blue O (sulfuric)	90°F.	105°F.	120°F.	138°F.	190°F.

* The exhaustion of 0% at 120°F. is only a token figure in these cases, as the dyestuff starts exhausting below this temperature as indicated by the curves. It is advisable to start dyeing in these cases at room temperature.

Figure 25

to the curves. It seems that the indigoids, like Algosol Blue O4B, are influenced more than the anthraquinone types. Algosol Blue O4B exhausts quite rapidly in the presence of ammonium sulfate, as can be seen from Figure 24. It exhausts more quickly than, for instance, Algosol Olive Green IB or Algosol Red IFBB shown in the same figure. In the presence of ammonia the exhaustion of Algosol Blue O4B is retarded to quite an extent. It does not exhaust any more at 130 or 140°F. but starts exhausting only at about 180°F. The exhaustion of an anthraquinone type like Algosol Red IFBB is not influenced much by additional ammonia as it exhausts normally at about 180°F. The result is that both the indigoid and the anthraquinone exhaust at about the same time. The more important conclusion to be drawn from this is that any shading should be done below 180°F., and then only after the bath is made alkaline with ammonia. An addition of Glauber's salt can also be recommended.

In practice you will find it usually unnecessary to exhaust the bath with acetic acid. It is true that the curves for some Algosols show that complete exhaustion is obtained only after the addition of acetic acid. But we must say that the use of acetic acid would be necessary only

in a limited number of cases where relatively high amounts of dyestuffs are used. Most dyeings produced with Algosols will be light or medium shades. They exhaust with ammonium sulfate alone. In case of doubt the amount of ammonium sulfate can be raised to 10%.

We can give you a simple method of checking the dyebath for exhaustion. To 2-ounce bottles, about one-half filled with the dye-liquor, we add 5 cc. of a 10% solution of sulfuric acid and 1 cc. of a 10% solution of sodium nitrite. The developed shade appears almost immediately, and the exhaustion can be watched thus from time to time as convenient. In case the developed bath shows an inclination to precipitate in the test bottle, we suggest that a few drops of Igepal CA Extra be added. This will keep the precipitate in such fine dispersion that it appears as a pseudo-solution.

Developing

Having shown that the application of Algosols on wool has no similarity to their application on vegetable fibers, we shall discuss their different behavior during development. We said at the beginning of this paper that the leucoester, after dyeing, has to be developed on the fiber, to the original vat dyestuff, by an oxidizing agent in the presence of acid. The regeneration of the Algosol to the original Indanthrene is the most valuable property of this group. Different Algosols have different oxidation potentials. The cotton dyer and printer knows that the potential of oxidation depends upon the choice of oxidizing agent, the pH value of the medium and the temperature. The oxidizability of the Algosols increases with molecular weight and with the number of substituent groups of positive character. So Algosol Green IBW, and Algosol Olive Green IB are easy to oxidize because of their high molecular weight and their positive methoxyl groups. Algosol Blue IBC, Red IFBB, Grey IBL, for instance, are easily oxidized because of molecular weight combined with positive imino groups. An exception is Algosol Blue O, which is easily oxidized despite its low molecular weight. Oxidation can be retarded by the introduction of negative halogen, as in the case of Algosol Blue O4B or 06B.

Taking the different oxidation potentials of the Algosols into consideration, the printer arrives at many different complicated formulations. The wool dyer has an easier task. He does not need to consider nitrite, except for Algosol Blue O and OR, or chlorates, or peroxides. The oxidation on wool is quite generally carried out with sodium bichromate in the presence of sulfuric acid.

There are Algosols like Algosol Green IBW or Algosol Orange HR which can be developed with sodium nitrite. Quite a few can be oxidized with potassium persulfate. While some, like Green IBW, Olive Green IB and Blue IBC are easily overoxidized with persulfate, others like Pink IR Extra and Red Violet IRH do not develop to the full depth of shade. In combination dyeings we might have representatives of both easily and difficultly oxidizable Algosols. If such are developed with persulfate, some Algosols might be overoxidized while others might not fully develop. Therefore we do not suggest the use of persulfate for the development of leucoesters on all wool material, at least not for the regular mill runs which we are discussing now. There would not be much advantage in using persulfate anyhow, as wool is tinted by persulfate almost as much as by bichromate, strange as it seems. A blank test will show this and also a baby blue or pink developed with persulfate and bichromate. It is much more convenient if we can use one developing method for all Algosols. The exceptions are always Algosol Blue O and OR.

Sodium bichromate as a developing agent is quite satisfactory and has been used with success for years. The minimum amount of bichromate is 0.7% and the approximate maximum should be 2.5 to 3% on the weight of the wool. The amount should vary slightly with different liquor ratios. We found that the bichromate should be increased when the liquor ratio goes above 1:50. By the same reasoning one might be inclined to decrease the bichromate at short liquor ratios below the amount of 0.7%. While this can be done to a limited extent, with very light shades and easily oxidizable esters we suggest not to cut the amount of bichromate too much. Rather than decrease the bichromate below 0.5% we increase the amount of ammonium sulfocyanide, if we desire bright and delicate shades.

Here a new product enters our discussion. Ammonium sulfocyanide (ammonium thiocyanate) is used to prevent over-oxidation of the leucoester. Ammonium sulfocyanide obviously forms complex salts with chromium which seem to have a controlled oxidizing action on the Algosols. Furthermore, it prevents an excessive deposit of chromoxide on the fiber. The buffering action of the ammonium sulfocyanide cannot be underestimated. If the addition of this product to the developing bath is omitted, most shades will come out considerably duller. In most cases we need 1% ammonium sulfocyanide, for heavier shades 2%, and in extreme cases 3%, on the weight of the wool. Since the potential of oxidation is at its maximum at a low pH, sulfuric acid is being used, 13 ounces per 10 gallons of water (10 g per liter). While the amount of acid can be reduced gradually to about 9 ounces when the liquor ratio increases to 1:75, there are indications that this amount is not sufficient when the liquor ratio goes as low as 1:10.

DEVELOPING. We prepare the developing bath with the acid, then add the bichromate, and then the ammonium sulfocyanide. The bath should be lukewarm. The temperature is raised to 180-190°F. in 30 minutes, and is kept for 30 minutes at about 185°F. Then we rinse and neutralize cold with 2% soda ash, on the weight of the wool, which gives us a pH of about 5.

Realizing that the handling of large amounts of sulfuric acid might be objectionable, we have tried to substitute other acids for sulfuric. Very few commercially available acids produce the desired effect.

PHOSPHORIC ACID. Phosphoric acid develops most Algosols in the presence of bichromate, but the resulting shades are usually considerably duller, just as the phosphoric acid esters of the leuco compounds as such are duller than the sulfuric acid esters.

SULFAMIC ACID. Better results are obtained with sulfamic acid. The constitution of sulfamic acid is obtained by substituting one hydroxyl group in sulfuric acid with an amino group. Since this acid is commercially available in crystalline form, which dissolves readily in water, the danger of workmen being burned is practically eliminated. Stainless steel shows less than one-fifth as much corrosion with sulfamic acid as with sulfuric acid. Our main reason for selecting sulfamic acid, however, was for the sake of the wool. We learned that sulfamic acid damaged gelatine less than sulfuric acid. It was thus logical to transfer this experience to wool. It would be quite an accomplishment if the tensile strength of high-grade woolens could be improved. While we found a 10% better tensile strength on piece goods when we used sulfamic acid, we were disappointed at the outcome of large scale mill runs carried out comparatively with sulfamic acid and sulfuric acid on loose wool. The wool developed with sulfamic acid did not show any advantage during spinning, weaving or other operations, nor was the tensile strength of the finished pieces improved. We must say, however, that both sulfamic acid and sulfuric acid developments produced pieces which showed a 10 to 20% better tensile strength and were fully as good in all other physical properties as the regular pieces made in this mill with chrome-dyed wool. We must mention

that dyeings developed with sulfamic acid are sometimes duller. This can usually be overcome by increasing the amount of ammonium sulfocyanide.

What happens when a dyeing is not fully developed? Under the influence of ultraviolet light and the oxygen of the air development will eventually be completed. This means that underdeveloped dyeings become stronger under exposure to light. Algosols that develop easily under normal conditions are not necessarily the most sensitive to light. For instance, Algosol Pink IR Extra, which is relatively difficult to develop under normal conditions, develops completely in ultraviolet light. When, therefore, we apply Algosol Pink IR Supra to wool, and expose it to light under a negative, we obtain in a few minutes a perfect image.

After we have explained the principles of the dyeing of Algosols on wool, we must raise the question "At what state can they be applied?" The most ideal is the dyeing of raw stock and slubbing. Shading is not necessary because different lots are always blended together. No difficulties should arise. Only with very fine cut tops in a certain one-way high pressure machine did we encounter trouble now and then, in that the extreme lower part of the machine dyed a lighter shade than the rest. This part turned out to be mostly undeveloped, probably because the cut tops packed together too tightly on the bottom of the machine during the cold rinsing before development. When phosphoric acid is used, the bath needs to be cooled down only to 160-170°F. as the development in the presence of phosphoric acid does not start below 170°F. A tight packing of very fine wool is, therefore, avoided.

During fulling a distinct brightening of shade usually occurs, which in our opinion, is mainly due to some chrome oxide being removed.

The materials which we have exhibited here were manufactured from blends dyed with Algosols. Comparisons of fastness to light which were carried out by the mill against their regular chrome-dyed goods, showed an unquestionable advantage. An exposure which caused the chrome dyeings to break considerably caused no change at all in the Algosol dyeing.

The blankets exhibited here were dyed in the raw stock with Algosols, were woven with white and then bleached with peroxide. You know that this cannot be done with acid or chrome dyeings. It is also evident that shades of such brightness cannot be produced with chrome colors. And you know further that fastness to light or washing is rather inferior in such shades produced with acid colors.

Some of the Algosols dye tippy on light-damaged wool. It is interesting to note that the tippiness occurs only with the anthraquinone types, the corresponding vat colors of which need a high amount of alkali for fixation on wool. The tippiness of all can be corrected with Peregal TW with the exception of Algosol Blue IBC. It happens that the corresponding vat color of this incorrigible Algosol demands the highest amount of caustic soda for fixation on wool, a fact which we should contemplate.

We show here a grey knitting. The worsted yarn was dyed in a mill on packages with Algosols. To make full use of the fastness to washing a batch was dyed on packages with Algosols and then chlorinated. This is a knitting from the chlorinated batch.

To complete the story, we have here a beige knitting dyed with Algosols on chlorinated yarn. Level dyeings throughout the package were obtained, as illustrated by the cones and by the knitted pieces which I have here.

Since all books and references state that it is not possible to dye Algosols on piece goods, with the exception of Algosol O and OR, it was especially intriguing to carry out mill runs with Algosols on piece goods. Using my curves as a guide we proceeded with a single dyestuff, in this case 0.35% Algosol Pink IR Supra. The dyeing was carried out with ammonium sulfate and Glauber's salt. After the boiling point was reached, boiling was continued for only 30 minutes. We have established that only a very few Algosols boil off and on. (Only when dyeing from a bath containing no acid, but high amounts of Glauber's salt, can a good boiling on and off be observed. However, the exhaustion is not satisfactory in most instances and cannot be controlled.) Neither do we seem to have a reorientation of the dyestuff molecules after the boiling point is reached. Therefore we saw no reason to continue boiling any longer, especially since all the dyestuff was exhausted. The dyeing is perfect, although we cannot classify Algosol Pink IR Supra as a level-dyeing type for the above given reasons. Of course, you will say it is easy to dye a single product, but how about a combination? Well, going back to my curves, we selected a combination of Algosol Blue O4B, Algosol Olive Green IB and Algosol Red IFBB. This was done for the following reason. You will see from Figure 24 that Algosol Blue O4B exhausts rapidly and is exhausted 75% when the bath reaches 180°F. But at this temperature Algosol Red IFBB only starts to exhaust, while Algosol Olive Green IB lies in between with an exhaustion of about 30%. Our argument was that any combination should dye level if level results could be obtained with such a combination as this. The first dyeing was not quite satisfactory because of a slight shadiness from side to center, but the dyeing was not streaky. Before the next attempt the piece was scoured first with Igepal CA Extra and ammonia and then rinsed. The dyeing was carried out as before. Tests showed that Algosol Blue O4B exhausted distinctly more slowly on the scoured piece than in the first trial. We have mentioned before the apparent influence of ammonia on the exhaust of indigoids. The result was very good. We repeated the same adverse combination on yarn in a package machine. This level dyed grey knitting is the result of this mill run.

This yellow piece is dyed with a combination of Algosol Golden Yellow IGK, Algosol Yellow GCA and Algosol Olive Green IB. The dyeing was carried out like the grey. The result is perfect.

However, there is one difficult step we have not discussed so far. How can we match to shade? Depending on the exhaustion we take a sample after 15 or 30 minutes boil and submit it to quick development. For this quick development a bath containing bichromate, sulfuric acid and ammonium sulfocyanide is prepared. The amount of sulfuric acid is always 25 cc. of a 1:10 solution for 200 cc., and the ammonium sulfocyanide is 15 cc. of a 1:100 solution. But the amount of bichromate differs with the shade and the depth of the dyeing. It is difficult to predict which amount of bichromate produces a close enough approximation to make additions possible. This is a matter of experimenting and has to be worked out in the mill. For medium shades we generally use 1% of bichromate. As mentioned before, additions should not be made above 180°F.,and the bath should be neutralized with ammonia. A further addition of Glauber's salt is also advantageous. We feel that once a mill has established its formulas, very close repetition of the shade should be possible, as Algosols exhaust virtually 100 percent. The best shading colors in our opinion are Algosol Golden Yellow IGK, Algosol Scarlet IB and Algosol Printing Blue IGG. The latter is the best level dyeing Algosol. It boils off and on as well as a level-dyeing acid dyestuff.

Another field where Algosols can be used to advantage is on union goods. Many of you have tried to dye mixtures of wool and rayon with Algosols to obtain tone-in-tone dyeings. We have found that it is rather easy to dye the wool alone and leave the rayon or cotton white. We show here materials which illustrate such rayon white effects. They are used for sport

shirts which can be washed and exposed to the Florida sun. This material contains 80% rayon and 20% wool. We leave the rayon white by dyeing at the boil with ammonium sulfate or acetic acid, simply omitting the Glauber's salt. Not all Algosols, however, produce a perfect white on rayon. A selection has to be made, especially if the rayon is tinted with an Algosol which is not as fast on rayon as on wool. It is worth while to mention how perfectly the complete exhaustion of the Algosols can be utilized. Dozens of matches were produced in our laboratory on 5 g. pieces. The dyer in the mill took the whole formula, dyed it on a set of pieces and in each case obtained the exact shade without making any additions. This may sound unbelievable, but since the material contains only 20% of wool a strength difference of 10% is not perceptible.

Lightfastness on Wool and Cotton

Many of you will wonder why we use indigoids like Algosol Blue O4B. The printer and cotton dyer will say it is not fast enough. Gentlemen, I assure you on wool it is fast. And how can you produce the brightness of the shade of Algosol Blue O4B with any other type?

If you investigate this grey dyed material you will find that it can hardly be improved. Only 0.1% Algosol Blue O4B, 0.108% Algosol Red IFBB and 0.04% Algosol Olive Green IB; that means only 0.25% total dyestuff was used to produce a dyeing better than light standard #7. The Blue O4B does not fade out of this combination after 20 days in the sun. Not even the slightest break to the red side is visible when light standard 7 shows a slight fading. The fact is that the indigoids which have no fastness on cotton are much faster on wool. Anybody here can prove with the help of a Fade-Ometer that I am wrong. Anticipating this I have to prove that the Fade-Ometer is wrong, and that is easy. I have here another grey dyeing, a combination of Algosol Grey IBL, Algosol Pink IR and Algosol Green IBW. This dyeing was exposed in the Fade-Ometer for 40 hours together with the official standards. The amazing fact is that it fades as much as light standard 4. The cotton dyer will say the Grey IBL is not fast. But, gentlemen, it is fast, if you expose it to sun light. The same dyeing which fades in the Fade-Ometer with light standard 4, fades in the sun with light standard 7. In addition to this I would like to say that the same Algosol or vat dyeing which is fast today might fade in the same Fade-Ometer tomorrow, even if the Fade-Ometer is perfectly controlled. Therefore, it will not be feasible to ask or answer a question like, "How many Fade-Ometer hours will this Algosol or vat dyeing on wool stand?"

Obviously, the question should be formulated differently, and it would be advisable to connect the answer always with the AATCC standards. With the exception of Algosol Orange HR, which does not possess a very good fastness to light, all Algosols can be used for wool, as far as the fastness to light is concerned. Since the fastness of the different Algosols varies between the products, it is of course possible to obtain dyeings which do not fade tone-in-tone. Since the experience of the cotton printer and dyer is not valid for wool, a new experience has to be acquired for finding the fastest combination for certain shades.

All Algosols seem to lose slightly in depth in the first washing without staining any other fibers. From then on, no change seems to be visible even after 15 washings. All Algosols are fast to dry cleaning on wool.

In general, we can say that the Algosols have about the same fastness properties on wool as the corresponding vat colors and that they give similar shades but usually are somewhat duller. The one exception is Algosol Red IFBB which produces on wool a much duller, yellower shade, evidently of a different chemical nature, since the Algosol is much faster to light than the vat color.

It is a strange fact that indigoids are much faster to light on wool than on cotton. We should like to offer an explanation for this based on the work of two men who did not connect their findings.

According to the theory of Engler, indigo is oxidized to isatin through the influence of light in the presence of water and the oxygen of the air. It is important to note that the oxidation of indigo occurs only if another substance is oxidized simultaneously. Haller found isatin *(Melliand Textilberichte,* 1928, pg. 415) in faded indigo dyeings on cotton, and he also found that the cotton was partly oxidized to oxycellulose. The cellulose is the substance which is oxidized simultaneously during light exposures. The cotton is in this case the oxygen carrier. It probably absorbs oxygen molecularly, forming a peroxide compound which reacts with the indigo, destroying it with the formation of isatin. With wool these reactions do not occur. Wool is not simultaneously oxidized, it is not an oxygen carrier. The conditions for Engler's theory do not exist and indigo is not oxidized to isatin. This might serve as an explanation why not only indigo but all indigoids are destroyed by light on cellulose fibers but not on wool.

Investigations which have been carried out in the laboratory have to be checked in the mill. We are grateful to those mills which have cooperated with us so far. Such cooperation is necessary if the wool industry wants to profit from research. If the research of the chemist in the laboratory brings forth active response from the industry, and I think I speak for all chemists, then he feels rewarded for his work. He can only give life to the child of his imagination, but he cannot feed it; he can put it on its feet, but he needs help to teach it how to walk. It is true the education of high class children is expensive, but once they are through school, they bring back manifold what they have cost. To be sure this beautiful material here costs 2 to 3 cents more per yard than the regular run with chrome colors. Yet, how much is 2 or 3 cents compared with the price of such quality materials.

May we remind the woolen and worsted manufacturer that expensive Algosols in most complicated formulations were used before the war for printing millions of yards, when the price of the 80 square cotton was 14 cents. If the printing industry had not cooperated wholeheartedly, it would not have acquired the ability to manufacture the high-quality material of today.

The author wishes to express his special appreciation to those firms which so kindly cooperated in the prosecution of this research. They include the following:

Julius Forstmann & Co., Passaic, N. J.; United Wool Piece Dyeing and Finishing Co., Passaic, N. J.; B and O Silk Dyeing Co., Elmhurst, N. Y.; Chatham Manufacturing Co., Elkin, N. C.; F. P. Maupai Dyeing Co., Inc., West New York, N. J.

Discussion

Dr. H. A. Thomas: Is it possible to dye Algosols according to a metachrome method as is done in the case of chrome colors?

Dr. Luttringhaus: If the Algosol bath is not completely exhausted and you add sulfuric acid and bichromate to this bath, you will obtain a dyeing which shows considerable crocking. The unexhausted Algosol precipitates after oxidation and forms a pigment which crocks later on. If, therefore, a metachrome method should be devised for Algosols, the resulting dyeings would always produce a poor fastness to crocking. Therefore, I think that such a method would not be feasible.

Dr. Thomas: Have you ever dyed peanut fibers with Algosols?

Dr. Luttringhaus: We have not done any dyeing of Algosols on peanut fibers so far.

Dr. Thomas: My suit is a mixture of rayon and wool. This material was piece dyed with chrome colors so that the rayon is left white. Would you say that Algosols

would produce faster dyeings on the wool than the chrome colors?

Dr. Luttringhaus: You would definitely obtain a better fastness with Algosols. In some cases we had to expose material of that kind for 360 hours to see a break at all. That was, of course, only in cases of perfect combinations and only then when the Fade-Ometer behaved.

Dr. Thomas: I was very glad that you mentioned the inadequacy of the Fade-Ometer. We in England have also found that the Fade-Ometer is unreliable in many instances.

Dr. E. P. Sommer: Have you found instances where the Algosol tinted the rayon or cotton considerably and, therefore, produced an inferior fastness to light on the vegetable fiber?

Dr. Luttringhaus: Yes. If for instance Algosol Grey IBL is used for union material, the cotton will be tinted considerably and since this dyestuff is an indigoid, it will fade on the cotton, but not on the wool. The general impression from such a dyeing will be that the dyeing has faded altogether. Therefore, the dyestuffs have to be selected.

Question—Did you say that the yellow tips of the wool can be eliminated by the use of Peregal TW when, for instance, light blue shades have to be dyed?

Dr. Luttringhaus: When I say tippiness I mean only wool which was damaged by light and nothing else. I did not mean yellow tips of the wool which usually appear on the belly part. That occurs as you know from another reason and not from light damage.

—♦ ♦—

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(Continued from Page P171)

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TRADE NOTES • NEW PRODUCTS

• Dr. Killheffer Retires

Dr. Elvin H. Killheffer, of the Du Pont Company's Development Department, retired February 1 after 29 years service. He has had life-long association with the dyestuff industry and was one of the leaders in the development of that industry in the United States during and subsequent to World War I.

Elvin H. Killheffer

A recognized authority on tariffs and other international practices in the conduct of trade, Dr. Killheffer was a member of the United States delegation to the United Nations Conference on Trade and Employment at Havana, beginning in the fall of 1947.

He is president of the Synthetic Organic Chemical Manufacturers' Association and a member of the Agriculture Committee of the Chamber of Commerce of the United States; recently retiring as a director of the New York Board of Trade, and member of the Executive Committee of the Drug and Chemical and of the Textile Sections of the New York Board of Trade; chairman of the Executive Committee of the American Tariff League and a member of the Foreign Commerce Committee of the Chamber of Commerce of the United States. He is one of the organizers and a past president of the American Association of Textile Chemists and Colorists and the Textile Research Institute.

Born January 16, 1884 in Millersville, Pa., Dr. Killheffer was graduated from the Philadelphia Textile Institute in 1904. Then he entered the employ of Kalle & Company and was sent by them to Germany for further studies in organic chemistry, completed at the University of Berlin in 1906. Upon his return, he became chief chemist for Kalle & Company in New York.

After the outbreak of the first World War he organized Orient Trading Company (see REPORTER, page 638, December 2, 1946) and spent two years in China, procuring Chinese stocks of German dyes, then desperately needed in the United States. He organized and became president of the American Color Manufacturing Company, which was purchased by the Newport Company in 1918. Subsequently he held important executive posts as director and vice president of Newport Turpentine and Rosin Company, and of the Newport Company, and president of the Newport Chemical Works, Inc.

On the acquisition of Newport by the Du Pont Company, he became manager of the Fine Chemicals Division of the Organic Chemicals Department, as well as president of Gardinol Corporation and Acetol Products, Inc., former Du Pont affiliates. He assumed the position from which he is retiring in 1935.

• Change in Dates for Wet Processing Show

Announcement has been made that the Textile Wet Processing Equipment and Supplies Exposition originally scheduled for March 21-25 has been changed to June 6-10.

The exposition manager, Arthur Tarshis, states that this change was made in deference to the wishes of several important companies who want to display their products at this show but who are displaying at another event timed too close to the original March date.

Persons and firms who have applied to the REPORTER for tickets to this event will receive them at a later date.

• ASTM to Discuss Soaps, Detergents and Oils

The American Society of Testing Materials, Committee D-12 on Soaps and Detergents, will hold its annual meeting on March 22 and 23, 1949, at the Park Central Hotel, New York City.

Committee D-12 is made up of groups representing manufacturers, consumers and those of general interest. Its purpose is to investigate, promote and formulate methods of testing and evaluating soaps and detergents and the setting up of standard specifications to guide manufacturers and consumers in buying, selling and in their uses.

This meeting brings together the foremost experts and leading technicians in the country on soaps and detergents. It affords an excellent opportunity for an open forum and thorough discussion of test methods.

Because of the tremendous increase in the manufacture and uses of synthetic detergents and because everyone is testing these detergents in some manner or other there should be some common basis on which to evaluate them. In order to precipitate the thinking on test methods, the committee has arranged a program that should be of deep interest to all concerned.

The tentative program in part is as follows:

1. A display of data on commercially available soil cloths. These soil cloths will be exhibited and their uses explained.

2. A display of the Terg-o-Tometer. This is a small multiple washer that is now available. Its reproducibility has proven to be very good. It is now being used by a number of laboratories for making detergency and soil redeposition tests.

3. Committee evaluation of a canvas disc wetting test.

4. Presentation of data on standard soil and a standard washer as used by the American Washer and Ironer Manufacturer's Association.

5. A paper on apparatus for the performance testing of emulsion cleaners.

6. A paper on metal cleaning and soil detection through the use of radioactive compounds.

Members of the AATCC are invited to attend this meeting.

• Booklet on Mathieson Chemicals

A new booklet, "Mathieson Chemicals," has just been published by Mathieson Chemical Corporation. The 32-page illustrated booklet covers the history, operations and products of the company. Information is given on methods of production, properties and applications of caustic soda, soda ash, bicarbonate of soda, liquid chlorine, ammonia, dry ice and carbonic gas, hypochlorite products, sodium methylate, sodium chlorite and chlorine dioxide, and various specialties. Also included is a description of the recently devloped stationary mercury cell for the production of chlorine and caustic soda.

• New Refined Products Plant

The new plant of Refined Products Corporation of Lyndhurst, N. J., will be ready for operation about March 15th, 1949. This plant has the usual features found in modern plant construction such as air conditioning, glass brick partitions, tile trim, etc., but in addition all production equipment will be operated with especially designed push-button controls thus combining the feature of safety and efficient operation.

Special equipment to expedite intercommunication will be installed with four independent control stations located in the executive offices and laboratories as well as the loading and shipping platforms. The executive offices as well as the board of directors' room will be sound proofed by the use of special materials recently developed for this purpose.

The processing equipment will be practically all stainless steel, much of which was constructed to original specifications for the purpose of achieving continuous operation from the entrance of raw material to the delivery of the finished product to trucks or railroad cars. All interior paint and special finishes will have Perma-Cide incorporated in their formula. Thus, it is stated, the entire plant interior will be bacteriostatic and mildew resistant.

By purchase from the Lackawanna R. R. of the necessary land, a special spur has been constructed which will simplify the receipt of raw materials and facilitate prompt delivery of finished products.

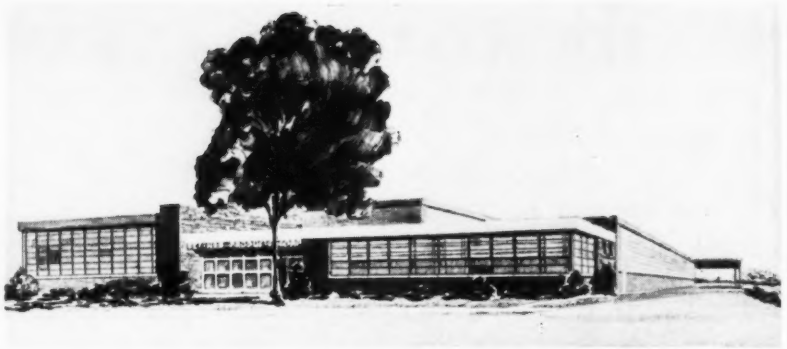
It is stated that during the last ten years, the increased demand for the detergents, penetrants, special finishes, organic mercurial salts, mildew proofing compounds, etc., manufactured by Refined Products Corporation has been such that this program of expansion was made necessary.

• Phoenix Chemical Company Organized

Announcement has been made of the formation of the Phoenix Chemical Company as a subsidiary of the Phoenix Oil Company of Augusta, Georgia. Officers of the new company are: W. L. McCrary, Jr., President; O. O. McGahee, Vice-President; Laurie E. Whittelsey, General Manager and W. Paul Bolen, Director of Research. Mr. McCrary is President of Phoenix Oil Company and Mr. McGahee, Vice-President. Mr. Whittelsey comes to the new company from Augusta Chemical Company where he also held the position of general manager. Previously he had been with Southern Dyestuff Corporation, Bibb Manufacturing Company, Maxon Textiles, Inc. and Swift Manufacturing Company. Mr. Bolen also comes to the new company from Augusta Chemical Company. His previous business activities included work as a research consultant and he held various positions with Dusseldorf Chemical Company, Berlin Aniline Works, Avondale Mills and Stonewall Cotton Mills. He served in the Navy during World War I and in the U. S. Maritime Service between 1941 and 1945.

The company will be housed in the Phoenix Oil plant at 625 Fifth Street and will manufacture detergents, adhesives, resins, dyestuffs and dispersing agents for textiles, plywood, leather and paper industries. The laboratory which Mr. Bolen will supervise is planned to be one of the most complete in the South. George Suhr will be associated with Mr. Bolen in this work.

The company will also represent some of the major national manufacturers in the chemical field.



New Plant of Refined Products Corporation at Lyndhurst, New Jersey.

• Chlorine Safety Chart

A new wall chart, "Recommendations for Safety in Use and Handling of Liquid Chlorine Cylinders and Ton Containers" has been prepared by the Hooker Electrochemical Company, Niagara Falls, New York. The chart lists recommendations for storage, handling and use of liquid chlorine cylinders, as well as emergency, first aid and prophylactic measures.

The 18 x 23 chart is printed in color on linen backed paper and is suitable for hanging in places where chlorine cylinders are stored or used. Copies are available upon request.

• "Karbate" Heat Exchanger

National Carbon Company's "Karbate" Impervious Graphite Heat Exchanger, Style FH, Size 1½, is recommended by the manufacturers for heating or cooling corrosive fluids, particularly in tanks with liquid depths up to 16 in. It is designed for horizontal operation and consists of two "Karbate" impervious graphite tubes 1½" I.D. x 2" O.D. in a parallel flow bank between "Karbate" headers. Connections for the heating or cooling medium are made with "Neoprene" "Flexlock" connectors.

It is stated that "Karbate" Brand Impervious Graphite has the well-known properties of high thermal conductivity (three times as high as carbon steel) and resistance to the action of most acids, alkalis and other corrosive, solvent or reducing agents, and particularly to all concentrations of hydrochloric acid and nearly all concentrations of hot sulfuric, phosphoric and acetic acid, wet chlorine and the organic solvents.

Since the units are assembled from stock items manufacturing time is materially reduced and quicker deliveries are possible.

"Karbate" Impervious Graphite Heat Exchangers, Style FH, are manufactured by National Carbon Co., Inc., 30 East 42nd St., New York 17, N. Y.

• Tennessee Eastman Color Card

An attractive color card, mounted with dyed swatches of acetate fabric, has been prepared by Tennessee Eastman Corporation, Kingsport, Tennessee, as a convenient visual color range of the various Eastman Acetate Dyestuffs now available. Included are Tennessee Eastman's line of Eastone dyes—those for plain or dischargeable dyeing of acetate yarn—and dyestuffs which have special light-fastness properties for acetate and nylon.

The Eastman Acetate Dyestuffs represented on this card consist of yellows, oranges, scarlets, reds, rubines, violets, blues, browns and blacks—for use as self-shades, in combinations, in cross-dyeing, in application printing, on jig and box, and at high and low temperatures. It is stated that all are the result of painstaking research and careful development,

with special attention to commercial fastness properties.

This color card is not intended as a source of technical information about Eastman Acetate Dyestuffs, but merely reveals the variety of colors made by Tennessee Eastman Corporation.

Eastman Acetate Dyestuffs are sold in the United States through Tennessee Eastman Corporation in Kingsport, Tennessee, and Lodi, New Jersey; and in Canada, through Clough Dyestuff Company, Ltd., St. Laurent, Quebec.

• Brown Instrument Appointments

The following appointments have been announced by the Brown Instruments Division of Minneapolis-Honeywell Regulator Company:

Warren W. Matlack named industrial manager of the New York City branch succeeding O. B. Wilson, now regional sales manager for the East;

Devon W. Fryback appointed district manager of the Albany, New York office succeeding Mr. Matlack;

D. Lyle Russell made industrial manager of the Hartford, Connecticut district office succeeding Mr. Fryback;

Herman Hoyler named industrial manager of the East Orange, New Jersey district office.

• Retires from Hooker

T. L. B. Lyster, chief engineer of the Hooker Electrochemical Company from 1914 to 1917 and from 1937 through 1948, has retired. Mr. Lyster had been associated with Hooker in various capacities since 1907 as construction engineer, director of development, consulting engineer and chief engineer. From 1922 to 1932 he devoted much of his time to pulp and paper industry service and engineering. Mr. Lyster will continue his service to the company as consulting engineer.

E. K. Newton, who has been with Hooker as an engineer since 1910 and has held various engineering positions with the company, has been appointed chief engineer.

• Establishes Consulting Business

Dr. E. P. Sommer announces that he has left the employ of General Dyestuff Corporation and is now established as a consulting chemist for the textile printing industry and affiliated activities. He anticipates that present engagements will occupy much of his time for the next two years. Dr. Sommer is located at 96 Prospect Hill Avenue, Summit, New Jersey; telephone: Summit 6-1713.

• Atlas Mineral Products Appointment

George L. Wirtz, president of Atlas Mineral Products Company has announced that Raymond B. Seymour (above), formerly chief chemist for this firm has returned as executive vice president and general manager. Dr. Seymour was previously associated with the development of several of the corrosion resistant cements, linings and protective coatings now manufactured by the Atlas Mineral Products Company and one of his assignments will be the direction of research toward the improvement and development of new protective coatings, linings and cements for the chemical, metal processing, steel, petroleum, rayon, food, paper, leather and textile industries.

Dr. Seymour has been associated previously with the Goodyear Tire and Rubber Company, Monsanto Chemical Company, Industrial Research Institute of the University of Chattanooga and Johnson & Johnson. He is the author of numerous publications and patents primarily in the fields of plastics, rubber and textiles.

He is a licensed engineer and a member of the American Institute of Chemical Engineers, American Chemical Society, American Institute of Chemists, American Association for the Advancement of Science, American Association of Textile Chemists and Colorists, American Society for Engineering Chemistry, American Oil Chemists Society, Alpha Chi Sigma, Sigma Xi and other technical organizations.

• Short Stroke Dancer Roll

An electronic device, known as the "Reliance VSS Short-Stroke Dancer Roll" and designed to meet two distinct speed control problems commonly associated with various types of continuous industrial process operations, is the subject of a new, two-page bulletin issued by The Reliance Electric & Engineering Company, 1076 Ivanhoe Road, Cleveland 10, Ohio.

In describing and illustrating this short-stroke dancer roll, Bulletin K-2101 explains how this recent development provides control tension for loops of material in process and control of motor speed in proportion to the position of some object or mechanism. Applications for which the VSS is designed include paper finishing, plastic coating, textile finishing, rubber extrusion and wire drawing.

Copies of the bulletin are available on request.

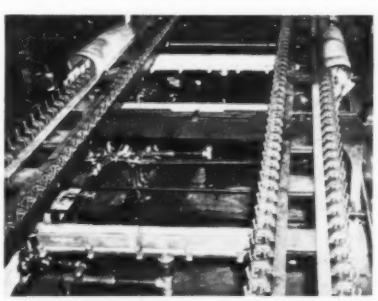
• Scholar's Microscope Featured

The new Spencer Scholar's Microscope is featured in the latest issue of *Laboratory Equipment Bulletin*, No. 106. Also described is a new stainless steel water bath with a double temperature setting at 37.5°C. and 56°C. Barnstead water stills and demineralizers are also discussed. Copies of this bulletin are available upon request to Will Corp., Dept. ADR-2, Rochester 3, N. Y.

• New Infra-Red Generator

Process Heating Inc., 346 Warren Street, Brooklyn 2, New York announces the development of a new Gas Infra-Red Generator that is said to burn with flameless, practically 100% combustion. The burner is made up of special cast iron segments, up to 12 feet in length in inch increments. A scientifically designed port permits the burning of manufactured, natural, propane, butane, mixed, or vaporified gas against a ceramic which becomes incandescent generating infrared rays and convected heat or hot iar.

The Process Heating Infra-Red Generator is said to have a high heat release. According to the manufacturer, the system has stepped up production in the textile field from 100% to 200% on tenter frames, 100% on slashers, 100% or better when used as boosters on steam cans, and about 250% on singers. It is claimed that it will cure material with speeds of 60 yards per minute on four color roller printing.



Tenter frame equipped with gas-burning Infra-Red Generators

• E. F. Drew Appointment

George H. Kent (above) has been appointed Director of Sales for E. F. Drew & Co., Inc., 15 East 26th Street, New York 10, N. Y. In this capacity, Mr. Kent will be responsible for the coordination of all sales activities of the operating divisions of the Drew Company.

Before joining Drew, Mr. Kent was Director of Sales Planning and General Economics for the Koppers Company, Inc. of Pittsburgh, Pa., and, previously, Director of Marketing Research for the Libby-Owens-Ford Glass Company of Toledo, Ohio.

• Technical Director, Quaker Chemical

The Quaker Chemical Products Corporation of Conshohocken, Penna., announces the appointment of W. J. Haring as Technical Director. Mr. Haring obtained his Bachelor's Degree in Physical Chemistry at Pennsylvania State College in 1933 and his Master's Degree in the same subject in 1934. He was a graduate scholar in 1934 and 1935 at the Carnegie Institute of Technology.

Mr. Haring has served with the W. H. Burns Company, the A. C. Ferguson Company, and joined Quaker in June 1944 as Plant Supervisor, subsequently going into the Control Laboratory, Research Laboratory, and became Director of Metals Research in 1945.

• Clark Thread Company Fellowship Awards

The Clark Thread Company has made available three Fellowships for graduate study and research in the field of textile technology at the Massachusetts Institute of Technology.

Holders of bachelor's degrees in Chemical Engineering and other fields of engineering or science from approved schools are eligible. Each Fellowship carries an award of $1800 per academic year which will pay for tuition and a large share of living expenses.

The awards are made on the basis of academic performance and professional promise and are offered to United States citizens and, on occasions, to those of Canada or Great Britain.

The purpose of these Fellowships is to encourage research and to stimulate an interest in technical training to supply the need for scientifically trained personnel for the thread industry of the United States.

Inquiries should be sent to: Dean of the Graduate School, Massachusetts Institute of Technology, Cambridge, Massachusetts.

• New Production Mill

Shown above is a new production mill recently perfected by Hy-R-Speed, Inc., 1127Z Riverside Drive, Los Angeles 31, California. Features claimed for this mill include: uniform output, sturdy construction, low initial cost, portability and compactness. Smooth operation is said to keep dust and noise to a minimum. Two small abrasive stones, one stationary, the other rotating at high speed, are said to produce extremely fast, efficient grinding, shearing and dispersing action which disintegrates, emulsifies, mixes and homogenizes. Special grinding surfaces have been developed in cases where regular stones are not practicable. Processors with difficult grinding or mixing problems are invited to submit samples for experimental processing without obligation.

• Philadelphia Manager for Calco

James Dixon (above) who, as noted in our January 24th issue, has been appointed Manager of the Dyestuff Department of Calco's Philadelphia branch.

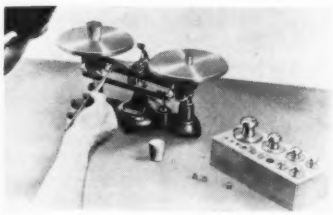
• Cartridge Model Demineralizer

The Penfield Mfg. Co., Inc., 19 High School Avenue, Meriden, Conn., has recently marketed a new low cost cartridge model unit demineralizer which, it is claimed, will produce a guaranteed effluent water, equal to distilled water or better, at a fraction of the cost. The flow capacity of this model is from 5 to 8 gph. This new unit is self-contained and the cartridges are easily replaced. No heat or steam is required to operate this unit and the water delivered is said to be free from calcium, magnesium and heavy salts. The cartridge comes packed with 4-bed activated ion exchange resins and has a capacity for removing approximately 1100 grains of dissolved ionizable minerals, expressed as $CaCO_3$, before becoming exhausted.

The unit consists of three parts: the removable cartridge, a cast aluminum wall bracket and an electronic conductivity controller which measures the quality of the treated water at all times.

The Penfield Mfg. Co. also produces large industrial models.

• New Harvard Trip Balance



The Ohaus Scale Corporation, 10-14 Hobson Street, Newark 8, New Jersey announces the availability of its new Harvard Trip Balance (above), featuring stainless steel weighing platforms and beams. This equipment is now available through scientific supply dealers. The balance (even arm scale for comparative weighings) is equipped with 6" diameter stainless steel plates at the points of continuous usage, where all-element resistance is required. It is claimed that heat, corrosion, chemicals or accidental, sharp blows cannot possibly affect the stainless steel weighing platforms or the stainless steel relief etched beams that give clear, accurate readings.

Ohaus patented bearing construction, employing self-aligning, polished agate bearings against precision hollow ground tool steel knife edges, are said to insure the maximum sensitivity attainable with this type of balance. The rigid cast iron beam is capable of withstanding heavy overloading without danger of deflection. All bearing parts are properly hardened and all vital components are heavily plated.

• Cravenette Appointment

The Cravenette Company, U.S.A., Hoboken, New Jersey, has appointed Moreland Chemical Company, of Spartanburg, South Carolina, to sell its water repelling preparations to finishing plants and mills located in the states of North Carolina, South Carolina, Tennessee, and Georgia. The representatives of the Moreland Chemical Company will be trained in the use and application of these water repellents to textile fabrics.

• Russian Petroleum and Chemical Data

Research Information Service, 509 Fifth Avenue, New York 17, N. Y. announces the translation and publication of the latest Russian technical and scientific data. The publication of articles from current Russian magazines will take place at regular intervals and will be expanded in the near future to cover all fields of research which are of interest to American manufacturers and researchers. A total of 79 translations have been made available since the beginning of 1949 and deal with the production of petroleum and the manufacture and analysis of various chemicals. The following catalogs are available without charge: Bulletin No. 27—Russian Technical Publications Dealing with Petroleum; Bulletin No. 29—Russian Chemistry.

Research Information Service also offers 1062 translations of German data published prior to 1949 covering various fields. Plans have been completed to widen the coverage of foreign developments. New catalogs will be issued periodically and will be available on request.

• New Product Development Department, American Cyanamid

The formation of a New Product Development Department has been announced by the American Cyanamid Co. This department, with George W. Russell as Manager, will report directly to the company's Vice President in charge of Research and Development.

One of the functions of the new department will be to determine whether there are economic uses for selected products which have been developed in Cyanamid's research laboratories, for which sales applications are not yet established. At present, most of the group's activity will be devoted to the evaluation of organic nitrogen compounds, although eventually the entire range of American Cyanamid's products will be included.

In addition to market development, the group will conduct market research on currently manufactured products, as well as those in the development stage.

OBITUARY

BERNARD T. NOLTING

BERNARD T. NOLTING, 61, secretary of Welch, Holme & Clark Co., Inc., importers and dealers in oils and chemicals, died at his home January 12. Mr. Nolting joined the company in 1905 at the age of 17. He is survived by his mother and two brothers.

CHARLES H. EAMES

CHARLES H. EAMES, formerly president of Lowell Textile Institute, died at his home in Billerica, Massachusetts on January 29th. He was 74 years old.

Mr. Eames was born in Andover, Massachusetts and graduated from the Massachusetts Institute of Technology in 1897 with a bachelor of science degree in engineering. He started employment with the Milford Light and Power Company and later went with the banking firm of Stone and Webster in Boston.

He was appointed an instructor in mathematics at the textile school in 1905, later becoming secretary to the principal. He was named principal in 1907 and in 1918 became president. He held this position until his retirement in 1945. During his tenure of office the institute had grown from a small trade school to a higher institution of learning which drew students from all over the world.

For the last thirty-five years Mr. Eames had been town moderator of Billerica and was well known throughout New England for his support of the town meeting ideal of local government.

Mr. Eames was a member of the American Institute of Electrical Engineers, the American Association for the Advancement of Science, the National Association of Textile Manufacturers and the Textile Foundation. He was a 32nd degree Mason and, at the time of his death, was vice-president of the Central Savings Bank of Lowell.

The Action of Light

(Continued from Page 156)

sensitive than bright nylon. A chart issued by Du Pont *(185)* indicated this same sensitivity of dull nylon.

This same chart showed that while dull nylon was resistant only more than silk, bright nylon was near cotton in resistance. However, these data were based on percentage of tenacity losses and since nylon starts at a higher strength, it actually remains higher in strength. Further tests conducted by Du Pont laboratories *(63)* showed that common nylon fabrics were more resistant than corresponding silk fabrics. Khandheria and Vaidya *(112)* reported that nylon exposed to sunlight lost a high percentage of its strength—in fact, British Patent No. 572,136 offers a light-protective treatment for nylon.

Boulton and Jackson *(33)* noted a relationship between strength and extensibility losses and fluidity rises of nylon exposed to carbon arc radiations.

VIII. Polyester

Terylene (Imperial Chemical Industries, Ltd.) is a recent British development. An introduction to this fiber *(12)* remarked its most notable property as being a strong resistance to light. The light stability of Terylene was noted by Cook *(53)* and by Turner *(203)*.

IX. Polyvinyl

Fibers from polyvinyl resins are sold commercially as "Vinyon CF" and "Vinyon N" (Union Carbide and Carbon Corp. to American Viscose Corp.), "Velon" (a "Saran" resin product made by Firestone Industrial Products Co.), "Saran" (Dow Chemical Co.), and "Geon" (B. F. Goodrich Chemical Co.). The first of these is a copolymer of vinyl chloride and vinyl acetate, the second of vinyl chloride and acrylonitrile, and the latter three products are copolymers of vinyl chloride and vinylidene chloride.

In discussions on Vinyon CF, Bonnet *(30, 31)* reported that its stability to sunlight was excellent and that it appeared to be more resistant to ultraviolet than did Vinyon N *(31)*. An anonymous reviewer *(10)*, however, observed that the above statement appears to require some limitation—that is, methods are available to prevent the discoloration of Vinyon [CF] during exposure to light.

In a discussion of the properties and uses of Vinyon N *(198)*, Stowell reported that unsatisfactory results were obtained in Fadeometer exposures (15 hours); 225 hours of sunlight exposure were obtained with the latest resins in production. The incorporation of light stabilizers has increased the resistance of the yarn to ultraviolet light. A strength loss of about 10 percent occurs at 100 hours, and this deterioration is accompanied by a darkening of the material.

Rowland's article on Velon *(163)* stated that an "extreme condition of light" caused loss of hydrochloric acid with subsequent degradation and decomposition of the molecule. Sherman and Sherman *(185)* noted that the effect of sunlight on Saran was slight and that on Velon it resulted in a slight darkening. No similar statement for Geon was found; this copolymer differs from Saran by containing proportionally more vinyl chloride than vinylidene chloride.

Comparative Ratings

The following are ratings compiled from tables occurring throughout the literature which present data evaluating the light resistance of two or more different textiles. However, since all the important relevant exposure data were not available, the results in many cases may be false. The ratings are based on percent loss in breaking strength with the more resistant textiles (those showing a low percentage of strength lost) placed above the less resistant textiles (those showing a high percentage of strength lost). The ratings generally placed wool in the top position and silk in the bottom position with the other textiles bounded by these limits.

WOOL—In 6 instances:

1 investigator placed flax above chrome wool, and rayons and mercerized cotton above raw wool.

5 investigators placed wool above all other fibers. In three cases, flax, and in four, rayons and mercerized cotton were considered in these ratings.

SILK—In 12 instances:

2 investigators placed silk above cellulose acetate.

10 investigators placed silk below all other fibers. In two cases, cellulose acetate was specified in general class of rayons.

COTTON, RAYON—In 12 instances:

1 investigator placed gray cotton above viscose.

3 investigators placed cotton above rayon, but did not specify state of cotton or rayon.

2 investigators placed cotton and rayon on the same level. In one case, bleached cotton and viscose, and in the other, cotton and high tenacity viscose were specified.

6 investigators placed cotton below rayon. In four cases, cotton was specified as gray, bleached, or mercerized.

LINEN, RAYON—In 6 instances:

2 investigators placed linen above rayon.

4 investigators placed linen below rayon.

COTTON, LINEN—In 6 instances:

1 Investigator placed cotton and linen on the same level.

2 investigators placed cotton above linen.

3 investigators placed cotton below linen.

GENERAL:

"Aralac" appeared to be similar to wool.

In 2 instances, 2 investigators placed nylon just above silk.

In 3 instances, 3 investigators placed jute just above silk; jute and nylon were not compared.

Hemp and ramie appeared to approach the ratings of cotton and linen.

In 3 instances, 2 investigators placed gray above bleached cotton; the third investigator placed them on the same level.

In 2 instances, 2 investigators placed mercerized above untreated cotton.

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TEXTILE COLORIST AND CONVERTER

Section

DERFLA HOWES SINGLETON
Editor

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Converting Markets

A fortnightly letter of news and views

February 14, 1949

DEAR DERFLA,

Turnover of finished goods was picking up in many departments as February got underway, but often under circumstances about which few of us could feel very happy.

The cost of booking rayon fabric orders, for example, was beginning to become painful for an increasing number of mills and converters. Sales of construction after construction were put through only at the expense of new price concessions. There were probably less than a half-dozen major rayons even partly immune to such experiences. Quite a few cloths were already bumping along at levels that seemed very close to break-even points, if not already there.

If the price purgative became no harsher than it was in recent weeks, one might be able to argue that the medicine was no stronger than had been called for by two years of an inflationary jag. Unfortunately, however, one cannot at this writing say with any degree of conviction that the dosage will not get worse. I am personally sticking to my earlier view that unit sales volume this and next month is going to be much heavier than now seems probable to the rank and file of sellers, but concededly the events of the past fortnight did not make it any easier to uphold my end of the argument.

AS you know, I contend that (a) today's rayon and cotton cloth values are so vastly improved that consumer buying should be well maintained in the next several months if (b) national income and employment during that period are held around recent high levels. Nothing has as yet happened to invalidate the first part of this theory, but as regards the second part there are some signs of a disturbing character, as you could see from the recent newspaper reports about declining industrial activity, weak security movements and bad breaks in commodity quotations. All of these developments suggest that general business will continue to soften. Momentarily, this possibility is a psychological hurdle rather than an active depressant for most of our cloth markets. What it means, in essence, is that a buyer would probably remain cautious about reaching for a cloth even if he knew that its price had been through the wringer.

From the very beginning of the postwar cycle of inflation-deflation, our textile integrations have acted as excellent market barometers. The verticals were at their zenith when profits were easiest and fattest. When profits began to ease and operating risks grew proportionately greater, the verticals retreated. Now we can see signs that the largest of the remaining rayon goods verticals are reacting to the latest deterioration of their market. During the first week of February, for example, there were a number of well authenticated advices to the effect that such sources were offering gray goods more freely to converters . . . and brokers.

YESTERDAY'S mail brought me a fragment of the textile revolution. To be more explicit, I received a 100 per cent nylon shirt. If we are to believe only a little of the claims that are being made, this is the garment that is some day going to take a big piece of business away from cotton and rayon shirtings and take it away permanently. Since some branches of the women's apparel trade are having experiences that tend to support such predictions, we had better not scoff about what could happen to other branches of the textile economy. Hence, it was with a feeling of profound

(*Continued on Page* 199)

Cotton in the Converting Industry

COTTON dominates the women's summer dress market and is gaining rapidly on competitors in other dress lines, including sportswear, according to a survey just completed by the National Cotton Council.

The survey was undertaken to give a cross-section of opinions by converters on cotton's competitive status and to ascertain means for strengthening cotton's position through research and sales effort.

In an advance report on the findings of the not-yet-public survey, a report prepared exclusively for *Textile Colorist and Converter,* it is stated that cotton accounts for more than two-thirds of the total volume of fabrics converted, a fact said to reflect cotton's basic advantages in the converter industry. These include: volume, versatility in end use, consistent quality, fashion, wide range of yarn sizes and general industry stability.

Fashion-wise, the survey points out, cotton has achieved preeminence. 'Today," it says, "cotton is a 'terrific' fashion item and this extends along all dress price lines with no signs that cotton will ever return to the pre-war position of being a material acceptable largely for utility use.

"Cotton's popularity as a style fabric also has helped enormously in overcoming seasonal limitations on the sale of cotton garments. Development of dark cottons for fall and winter did much to encourage steady selling of street and afternoon dresses. In fact, many retailers have already extended their season so that there is no lag in cotton dress sales around the calendar."

COUNCIL market researchers report that along with cotton's fashion acceptance, they found that more rayon dress makers are seeking cotton from converters to be made into garments for next spring and summer, and that some rayon converters appear to be interested in converting cotton fabrics as soon as mill sources can be established. Too, they said, converters are now trying to build brand names for their cotton products.

"Cotton styling has made brand name tie-ins possible, and these in turn help to maintain quality standards and establish pride and consumer confidence in the product," the report continues. "Moreover, high style cotton fabrics and garments linked to brand names lead to greater editorial interest. Fashion editors are giving more and more space to cotton, because cotton is news.

"The chances are that cotton's prestige will be enhanced even further as mills, converters, designers and finishers devote more talent and attention to cottons. Researchers found that the success of high style in cotton dresses is stimulating more styling for other markets such as children's wear, cotton lounging pajamas and nightwear."

Some converters urged that high style cotton should be carried particularly into the men's sport shirt market, the report states. Sport shirts they considered to be the key men's item susceptible to high style promotion similar to that in women's dresses.

THE Council's survey declares that converters believe intensified sales activities will permit the cotton industry and related groups to produce and sell more and better cotton products; that more ways should be found to present cotton's merits in a dramatic and effective manner; that constant promotion will keep cotton in high style by creating a deeper appreciation of cotton's quality advantages and by establishing pride in cotton products.

With respect to cotton's inherent qualities, converters are reported to have emphasized its comfort, launderability, absorbency and durability. "Cottons have a long service life," the report goes on. "They hold their shape because of fabric stability and adaptability to pre-shrinking. Cotton keeps a fresh, clean look. It feels alive and not cold or clammy. Mothers know that cotton is a suitable and practical fabric for clothing their children. Men know that a cotton shirt will still be a shirt after laundering. Women have confidence in the serviceability of their cotton dresses."

The Council's survey also points out that cotton's lack of slipperiness offers quality advantages to manufacturers, retailers and consumers. The survey states, "Cotton products can be boxed and shipped . . . without fear that the merchandise will shift or wad in one part of the container during transit. Retailers can stack cotton merchandise without the danger of merchandise sliding from counters. Consumers find cotton's lack of slipperiness advantageous in keeping blouses in skirts and shirt tails in trousers."

IN a section devoted to cotton's competitive position in finishing, the Council survey finds that the increase in cotton's strength when wet is cotton's outstanding advantage in the finishing industry because most finishing processes are performed while the fabric is wet. Materials that lose tensile strength when wet are very often distorted during finishing, it points out, adding that these distortions cause streaks and thin spots. "Cotton fabrics being stronger wet than dry are not

readily distorted," says the report. "By contrast, most synthetic fibers have a low wet strength, and to reduce distortions finishers must use special equipment for processing synthetics. These machines are delicate, require great care and supervision and must be operated at slower speeds. All these considerations add up to higher costs. At the same time, the development of new machinery for finishing synthetics may prove of advantage to cotton. Whereas synthetics cannot be finished on cotton equipment, cotton can be adapted for use on machines designed for synthetics. So cotton can fall heir to improvements in such equipment.

"Cotton has traditionally enjoyed two other major finishing advantages: it can be finished in large quantities on a continuous process and it can be vat dyed and pre-shrunk. A continuous process has been adapted to synthetics and some synthetics can be vat dyed and pre-shrunk. However, these adapatations require special allowances and inspection which increase costs."

According to the Council's survey, cotton holds a price advantage in finishing since cotton fabrics are handled in greater volume than other materials, and, they say, there is nothing to indicate that cotton will lose this advantage. Finishing costs for cotton have leveled off and appear to be stabilized, the report indicates, adding that finishing costs for other materials are still rising.

FURTHER research on qualities of crease resistance, drape, luster, slipperiness, hand, softness, smoothness, vivid colors, permanent finishes, and the production of long staple cotton and elimination of immature fibers would strengthen cotton's competitive status, the Council survey states.

Converters interviewed are said to have reported that cotton's crease resistant problem is all but solved. Several promising crease resistant finishes are now on the market. More "know-how" must be acquired but "working out of the wrinkles" in this important application will mean as much as did development of pre-shrinking and vat dyes.

Regarding drape, converters say that in many consumer items such as bathing suits and table cloths, cotton's drape is superior, the researchers report. However, methods should be developed which would further improve form fitting and moulding characteristics.

Luster can be given to cotton through mercerization, and mercerized cotton luster is preferred by many, the converters are said to have declared. On the other hand, a higher luster, comparable to the sheen of synthetics, often carries greater sales appeal. An inexpensive method for imparting various degrees of luster to cotton fabrics would help cotton's position, some members of the converting industry believe.

Despite the positive advantages that cotton's lack of slipperiness provides for many uses, a technique that imparts slipperiness to cotton fabrics would open such outlets as coat linings and women's lingerie. In such lines slipperiness is highly desirable.

"Converters have found that the hand of the product directly affects the customer's final choice," declares the report. "They buy cotton because it suggests body and serviceability. They buy lingerie because it has the hand of silk. This silk feel has been closely imitated by synthetics and frequently the purchase of a synthetic product is made for that very reason, despite the fact that it may not compare with cotton in other qualities. A process should be developed to give cotton the hand of silk. Then cotton would suggest utility or luxury, depending on its final use."

Converters regard softness as closely akin to feel and although the Council claims cotton is the softest apparel fabric available, nevertheless they grant that synthetics are sometimes considered softer because of their feel against the body. This is another reason why, they say, converters want to see processes developed for varying the hand of cotton. Smoothness, too, is a related quality. In this connection, research should be conducted to develop a process giving carded goods a smoothness comparable to combed cotton fabrics.

MORE vivid cotton colors are needed, the Council survey finds. These are now available or will be shortly, and they believe that manufacturers and finishers should use them extensively. For example, glove makers have recently learned that vivid colors can be applied to cotton dress gloves. Thus cotton may have a competitive edge in this line just as durability does in utility gloves.

Converters also are reported as having expressed themselves in favor of more permanent finishes for cotton, and more fabric research. Further efforts should be made, for instance, to develop cotton crepe yarns, and there should be study to improve efficiency in operation for all phases of processing and distribution. "More facts are needed on proper work loads and on various types of cotton finishes," the report adds.

Increasing the production of long staple cotton at lower cost is also said to stand high on the converters' agenda of necessary research. "Adequate quantities of cotton should be available in all desirable staple lengths and prices should be competitive with synthetics," states the Council's report on the survey. "Coupled with this consideration is the need to eliminate immature fibers. These cause lack of uniformity."

In cotton's price situation, the Council survey reports that, except for bag fabrics, converters see no serious indication that price-wise, cotton is losing to other materials in market outlets serviced by converters. Three basic considerations support this view: (1) In the utility field no other textile can compete with cotton on quality or price, (2) In the style market, price is not the primary consideration, and (3) Long range price trends will probably favor cotton.

Converters agree that low pre-war cotton prices were undesirable. According to the report. At the same time, they are quoted as believing price adjustments in raw cotton and fabrics will occur.

U. S. converters processed approximately a yard and a half of cotton fabric in 1947 for every man, woman and child in the world, according to the survey, which estimates that approximately 3,258,000,000 linear yards of cotton fabric produced in 1947—enough to encircle the earth some 130,320 times—were of the type usually handled by cotton converters instead of being sold direct by the mills.

Converters, it is estimated, handled more than three-fourths of the cotton goods printed and finished, about half of the fabrics plain dyed and finished, and slightly less than one-third of the goods bleached and white finished.

Independent converters, the report estimates, handled the majority of print goods, about 40 per cent of fine goods and 30 per cent of the plain goods. In terms of cotton bale equivalents, converters processed about 1,800,000 bales. Cotton accounts for more than two-thirds of the total volume of fabrics converted, the survey observed.

Causes of Damage to Textile Fibres

E. Kornreich on *Degradation Due to Processing and Methods of Identifying Faults*

(Reprinted from December 17, 1948—*The Dyer*, London

ADDRESSING the London section of the Society of Dyers and Colourists on the origin and identification of damage to textile fibres, on December 3, Mr. E. Kornreich said, referring to manufacture, "The most comprehensive source of damage is in finishing, which comprises a great number of operations using a wide variety of chemical and mechanical operations."

He divided the causes of damage into four groups: mechanical action, chemical influences, radiation, and microbiological attack, and after discussing the manufacturing and finishing process in which these might occur, went on to consider what happened to the fibres when attacked by various agents.

Cellulosic fibres attacked by acids lost their fibrous properties through breakage of the glucosidic linkages in the cellulose molecule, and the resulting product was commonly termed hydrocellulose. The course of action of acids depended largely on the mode of contact. While immersion in dilute acid for a prolonged period was comparatively harmless, a very dilute acid allowed to dry into the fibre caused serious damage.

Acid attack on proteinic fibres led to hydrolysis of the protein. Although nylon was affected by the acids, the mode of action was not yet understood.

THE action of alkalis on cellulosic fibers led to physical changes if certain concentrations were used. The high swelling brought about a more random orientation of the molecular aggregates. Acetate rayon was of course soluble in caustic soda above 5-6 per cent concentration, and was readily converted into regenerated cellulose by treatment with lower concentrations.

The two most common oxidizing agents were hydroclorite and peroxide. On cellulosic fibres hypochlorite acted as an oxidizing agent while it chlorinated some of their impurities. Breakdown of the fibrous high polymer occurred through opening of the ring structure of the molecule and the resulting product was commonly known as oxycellulose.

Proteinic fibres were chlorinated by hypochlorite. This led at first to physical changes, but breakage of the disulphide linkage and hydrolysis might take place on prolonged contact.

When used industrially for bleaching purposes, peroxide was applied from an alkaline solution, and its action was then purely oxidizing on cellulosic fibres, but alkali attack might take place on proteinic fibres. When, however, used in its commercial form, stabilized with small amounts of acid, its influence on cellulosic fibres was more due to the degrading action of the acid than to the oxidizing action of the peroxide.

AFTER this general discussion of the action of damaging agents Mr. Kornreich went on to describe the general procedure of identification of damage. In manufacture the investigation was mainly confined to process control by quantitative evaluation of the degree of degradation. Investigation of damage arising in use was mainly concerned with the identification of the damage, and, if possible, the determination of the damaging agent.

The most important of the large scale tests was based on the fact that the degree of polymerization governed the viscosity of a solution of the high polymer in a suitable solvent. The measurement of the viscosity, or its reciprocal, the fluidity, was therefore a means of evaluating the degradation of fibres.

Unfortunately, suitable solvents were available only for cellulose and silk fibroin. The measurement of the fluidity of cellulose solutions in cuprammonium was well known, and so was that of silk in cupriethylene-diamine.

Other methods of quantitative determination were based, for instance, on the reduction properties of degraded cellulose. This made possible the deposition of cuprous oxide from Fehling's solution, or the deposition of silver from a silver nitrate solution, known as copper number and silver number, respectively.

Other methods were based on the solubility of degraded cullulose in certain concentrations of caustic soda. The solubility number was well known and used for the control of bleaching of linen.

THERE were no uniformly applicable quantitative tests for wool fibres. Changes in the sulphur and nitrogen content of keratin were indicative of chemical change. Increased solubility of the protein in dilute alkali was also used for quantitative evaluation. Increased reactivity of the disulphide linkage in keratin made possible reaction with metals, and this property was used for estimation of chemical damage.

A point made repeatedly by speakers in the discussion which followed Mr. Kornreich's address was that the work of launderers and of garment dyers and cleaners would be tremendously facilitated if goods were labelled to indicate the fibres present and the finishing treatments.

Dyes sensitive to light during dyeing were mentioned by several speakers and it was pointed out that these dyes were not necessarily sensitive to bleach or ones which accelerated tendering.

Mr. Kornreich mentioned that some of the materials treated with optical bleaching agents seemed to have a high sensitivity to hypochlorite.

The Wool Outlook

by

FRANK L. FOREMAN,

General Sales Mgr., Botany Mills, at the 38th Annual Convention of the N.R.D.G.A.

THE subject handed to me to talk on is "The Wool Outlook." Lately, as a hobby and to pass some time, I took a few lessons in magic and I can really do a few tricks, but I'm sorry to say not one of them has anything to do with looking into a crystal ball and predicting the future. However, I do sincerely believe there are certain basic facts that can be a guide to all of us. I know that right now there is quite a little murmuring, whispering, and generally out of the corner of the mouth talk about present market conditions and the terrible things to be expected from here on. I have always been a confirmed believer that *in any kind* of a market, if your product is right and your dealings fair, and you work hard enough, you can do business. I think that holds good just as much today.

If you want statistics, which I think are pretty boring, I can give you a lot of them, along the lines that there are 60 million people in this country working steadily at the highest wages ever paid anywhere; that the highly increased birth rate during the past decade has created a new group of 17 million growing people which insures a wide and varied piece goods market for the next generation at least. Also, it is estimated that 52 million women are sewing today and this trend is being further accelerated by sewing classes in schools, by promotion and education of fabric companies, sewing machine makers, pattern producers, and retail stores. However, I said I do not like statistics, so enough of that!

ONE problem that you have (as I see it) is to utilize the money allowed to you for the buying of merchandise in a sound, intelligent and profitable manner. To do this you must be much more selective than you have had to be for the past several years when practically anything that was bought could be sold because of the scarcity. That does not hold good today and we all know it. However, I think your *real* problem is one of not letting your TOP Store Management treat piece goods as a stepchild, the way some of them did before 1941. We have a big volume in over-the-counter piece goods business today. Let's not lose it—there's no reason why we should. The one thing that could take it away quicker than anything else would be giving the American consumer inferior fabrics. Then I'll promise you that Mrs. Jones and Mrs. Smith, who buy the yard goods, the pattern and all that is necessary for the finished garment, plus putting in much time and effort only to find out that the dress, suit or coat doesn't give her the proper wear, will very quickly stop making their own clothes and all of us will have plenty to worry about.

AT this time the popular slogan seems to be "lower prices"... and after that, "some more lower prices." I say that any price that is a fair price for the right product is a low price. I do not care what that price is. I never bought a bargain in my life. Every time I thought I did, I got stuck. You are all people in business . . . you know the way costs have gone up . . . you know what labor is getting . . . and I can tell you from our end that the prices of raw wool and the cost of replacing machinery is not cheap. Therefore, in a market of this kind, without looking at any charts or even listening to the economists, I say that your only safe way to play this market is to buy standard, wanted merchandise from reliable sources, and there are lots of them. The worst thing you could do for the future of the woolen business is to start "sale-ing" it to death, always at lower prices than the time before, and always a little less true value—because you know as well as I do that anything you *have to sell* at $1.89 is only worth $1.89, even though the ad might read "formerly $3.95 to $4.95."

I firmly believe that the buyer who keeps his stocks clean and is even willing to sacrifice a little volume in order to continue to hold the *worthwhile* business is much better off than the one who is always trying for that traffic. Sometimes you have a lot of traffic but very little profit and quite a few markdowns.

Now, if you want me to go down on the dotted line, I am willing to say that from present indications, with the prices of wool and the costs of labor and equipment, I see no reason why woolen piece goods should take a nose-dive. There may be some weak sellers, both amongst mills and jobbers, who might have to raise some cash if business doesn't happen to be booming with them all the time, but it's an even money bet that if they do, it is because their merchandise was not properly made, styled, and correctly priced in the first place. Don't be short-sighted, and for the sake of a few sensational sale days, knock the props out from under a business that is one of the cleanest and most profitable operations in your store.

To sum up, I strongly believe that the outlook is as bright as ever for real piece goods business, if you go after it intelligently and with determination and enthusiasm.

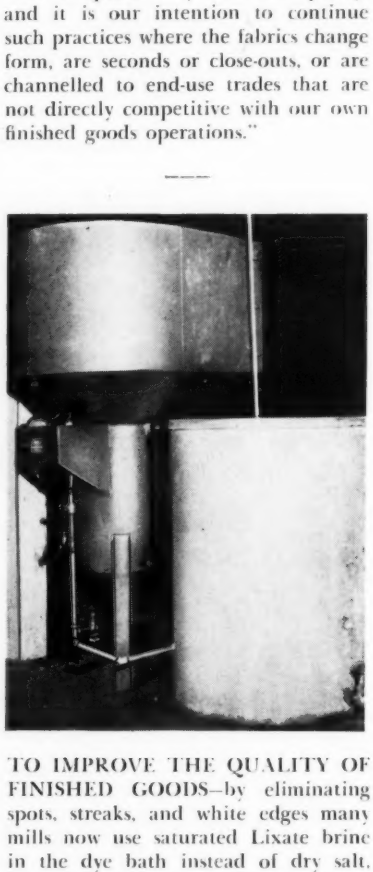
New Services, Products, Businesses

SCHEDULED MAINLY FOR PRODUCTION OF RAMIE CLOTHS—completion of the Clayton Textile Mills near Fresno, California is expected by mid-September, according to W. E. Clayton, president of the newly organized firm. The mill will also weave cotton fabrics. Costs are estimated to be about $2,200,000 for a concrete-steel structure housing 11,616 spindles and 185 looms. The mill will use about 36,000 pounds of California-grown cotton weekly when in full operation, but the most important fibre will be ramie. About 6,000 pounds will be processed and woven into some 4,000 72 x 108 ramie sheets weekly. Additional ramie production will be some 35,000 yards of broadcloth and light cloths and 17,500 yards of dress goods. Mr. Clayton predicted that in the next two or three years California may have 2,000 or 3,000 acres devoted to ramie, yielding some 1,500,000 pounds of fibre. Other officers of the Clayton Textile Co. are: W. E. Clayton, Jr., vice president; Robert Plunkett, treasurer.

THE TEXTILE FABRICS ASSOCIATION—will hold its annual meeting February 24 in the auditorium of the Western Union Building, 60 Hudson Street, it has been made known by William P. Fickett, president.

SACKS FABRIC COMPANY—has been formed to handle plain and printed rayons for the cutting trades. The company is headed by Sol Sacks, formerly a partner of Ideal Fabrics, Inc., now liquidated. Offices and showrooms have been opened at 469 Seventh Avenue.

BURLINGTON MILLS CORPORATION (N. Y.)—has reaffirmed its previously stated policy on merchandising of greige goods. Robert L. Huffines, Jr., president, pointed out that Burlington at all times has stated that it had not discontinued selling some goods in greige where such sales do not conflict with finished goods merchandising. As some examples, he cited the lining and industrial fabrics field. "The company," he continued, "has complied fully with this policy, and it is our intention to continue such practices where the fabrics change form, are seconds or close-outs, or are channelled to end-use trades that are not directly competitive with our own finished goods operations."



TO IMPROVE THE QUALITY OF FINISHED GOODS—by eliminating spots, streaks, and white edges many mills now use saturated Lixate brine in the dye bath instead of dry salt, according to the International Salt Company, Inc.

When dry salt is added it has a tendency to create areas of concentrated brine around the grains of salt, and these drive excessive quantities of dye into fabrics and cause spots and streaks. Because Lixate brine disperses evenly and immediately through the bath, it helps to eliminate this difficulty and to produce a smooth exhaustion of the dye, it is claimed. In addition to helping to eliminate re-dyes and achieve greater uniformity of shades, use of Lixate brine also increases plant efficiency and reduces operating costs as well, it is stated. It cuts salt consumption and also eliminates the work of unnecessary salt handling, because Lixate brine is made automatically in a Lixator from Sterling Rock Salt and is then piped to its various points of use in the plant. An engineering development of the International Salt Company, Inc., Scranton, Pa., the Lixator pictured above, consists of a rock salt storage hopper over a dissolving tank with a brine collection chamber. Rock salt flows by gravity into the tank at the same rate it is dissolved, automatically replenishing the supply. Water enters near the top at the rate at which saturated brine is drawn off. As the water flows downward, it dissolves the rock salt until it becomes fully saturated some distance from the bottom of the tank. From that point on the remaining rock salt acts as a filter bed that removes all insoluble matter from the brine. As a result, when it reaches the collection chamber, the brine is crystal clear and fully saturated.

AMERICAN BEMBERG CORP.—has laid off 400 workers in their plant at Elizabethtown, Tennessee. Judge Ben Allen, executive vice-president, said he hoped it was a "temporary layoff" and explained it was a result of "a slackening of yarn demand." All those laid off, mostly women, were employees of the textile department. They will not return until further notice. Three shifts are affected.

OBERMAN FABRICS, INC.—is introducing in iridescent foulard, known as Rainbow, for evening dresses, decorative uses, and linings, according to Harold S. Rubenstein, vice-president.

HELP IN DETERMINING THE DEGREE OF COLOR CHANGE PERMISSIBLE IN A FABRIC—before it is considered too faded for further use will soon be asked of textile experts and the average housewife. In a survey to be conducted by a subcommittee on washfastness of colored textiles of the American Standards Association, technicians and consumers will examine certain sample fabrics which have been commercially laundered several times. Each fabric will be classified regarding its end use so that the examiner can think of it not as a piece of cloth but in terms of the use to which it will be put. For example, the top and bottom of a child's two-piece snow suit will be

subjected to separate wash tests—the pants being laundered more often than the jacket. At what point will the difference in color between the two parts be considered too great to continue to use as an ensemble?

From these results, members of the subcommittee hope to discover what degree of color change is acceptable in a fabric and at what point it becomes unsatisfactory in the eyes of the consumer. Following this, the subcommittee will analyze what conditions led to this point of dissatisfaction in the sample and then attempt to create the conditions in a laboratory test procedure.

TENDER TONE-ON-TONES express an appealing fashion motif of quiet charm and delicacy in the Confidential Advance Rayon Collection for Fall 1949, just issued by The Textile Color Card Association to its members. Portrayed in six groups of a harmonizing light and medium shade, these discreet cloudy tones, as announced by Margaret Hayden Rorke, managing director of the Association, include *Gentle Pink* and *Glacé Rose, Azure Cloud* and *Blue Dove, Sanblond* and *Patina Brown, Faded Lilac* and *Muted Mauve, Shadow Aqua* and *Nebulous Blue, Limefrost* and *Olivemist*. Because of their soft hazy quality, Mrs. Rorke added these gentle tones are ideal for effecting harmonious color combinations, which reflect a new style trend in costumes, millinery and accessories.

Striking an entirely different note are the highly intriguing *"Dark-of-the-Night" Colors*, comprising eight extremely new dusky shades which are expected to occupy a leading position in the fall fashion spotlight. These unusual deep tonalities comprise *Chameleon Green, Midnight Purple, Autumn Wine, Nocturne Grey, Rose Acajou, Paris Taupe, London Green* and *Rendezvous Brown*.

Winter Melodies, highlighting six distinctive sets of harmonizing medium and darker shades, further illustrate the increasing style significance of tone-on-tone treatments. Prominent in this basic color range are *Mordoré Brown*, possessing a rich golden undertone, and the lighter blending shade, *Spiced Honey*. Also cited as important are a lively medium blue called *Blue Flame* and *Carbon Blue*, a deep inky version. *Fireglow*, a flaming scarlet hue, and the deeper *Red Lustre* sound a smart vibrant note in the autumn color scheme. Greens, which show every indication of maintaining their strong fashion prestige, are represented in two interesting groups, namely, *Dusty Jade*, a soft modulated tone, paired with the lighter harmonizing *Frappé Green* and *Green Cedar*, a deep forest or pine type, shown with the lighter blending shade, *Sunset Green*. The frosty *Silver Ice* and the darker *Smoked Crystal* interpret new renditions of grey, giving further style impetus to this neutral gamme for fall and winter.

A SPECIAL GROUP OF WEATHER-RESISTANT DECORATIVE FABRICS shares the spotlight with wrought iron furniture in elegant lines comparable to the finest wood furniture which has now been styled for indoor and outdoor decoration.

The collection was styled by James Amster, of Amster Yard, 215 East 49th Street, who has also styled for F. Schumacher & Co., a series of fabrics on Twill, Mainsail Cloth, one on Koroseal, and a wide range of solid colors on patent-finish Naugahyde. The new line was introduced here by Altman's, on February 15, to coincide with an editorial feature appearing in Vogue magazine, and simultaneously at leading department stores throughout the country, according to a joint announcement by Mr. Amster and Rene Carrillo, Schumacher's executive in charge. Suitable equally in living rooms, dining rooms and foyers, as well as on the terrace, the fabrics are used as zippered slipcovers over seat and back cushions, and will also be available by the yard for upholstery, draperies, awnings, umbrellas and bed spreads. In addition to being water-repellant, the fabrics will not crack, peel, rot or stain, and are color-fast, washable, pre-shrunk and crease-resistant, it is claimed.

REDUCTIONS OF UP TO 21 PER CENT IN AIR-FREIGHT RATES—on clothing, fabrics and drygoods, yarns and trimmings between New York and western Europe have been announced by Seaboard & Western Airlines. The new lowered rates are in effect between Frankfurt, Germany and New York for the first time. They also include shipments between Paris, Geneva and Brussels and New York. Specific commodities covered in the lowered tariff schedule including clothing and wearing apparel, cloth, dry goods and fabrics, embroideries and embroidered articles, lace and lace articles, nylon and nylon products, straw braid manufactures and yarns of all types. Prices are quoted for minimum shipments of 100, 1,000 and 3,000 pounds.

A NEW RAYON BIAS SEAM BINDING—is announced by the William E. Wright & Sons Company, West Warren, Mass. The manufacturers claim that it will follow the curve of the hem line on swing skirts and full skirts by laying smoothly where stitched to the raw edge of the skirt and that it does not gather fullness or pucker. Wright officials also reported that the binding required a new fabric and compounds not previously used, as well as a new technique in manufacturing. It has high wearing strength, extra sheerness and a wide range of colors, Wright officials said.

Converting Markets

(*Continued from Page* 193)

scientific curiosity that I slipped into My First Nylon Shirt. Many of my readers, I imagine, will be almost as much interested in learning of my reactions as I am in pursuing the experiment.

To begin with, The Shirt was noticeably "cold" to the skin on the frigid February morning when I first wore it to the office. This did not surprise me, as the women of my family had had similar sensations with nylon hosiery, knitted undergarments and nurses' uniforms. The texture of the material was a little strange to the hand. It felt like a very fine taffeta, more crispy than supple. I don't think that this particular reaction is too significant, for in due time we can expect softer nylon shirtings to be woven. During the course of My Day I visited a well-known cloth broker's office and immediately became an object of envy as well as of laboratory interest. I barely escaped from that trap with a full set of shirt tails, as the broker's men all wanted samples of the cloth.

What intrigues me most, of course, are the washing directions. My nylon shirt, I am told, will never have to suffer the tortures of a commercial laundry. All you have to do is "Wash it! Hang it up to dry! Wear it in an hour!" Women already know the meaning of rapid-drying nylons, but how in the world can rugged (?) man ever get used to the idea of sharing space on the family shower curtain with his lady's sheer hose and undies?

There's much more to be told about My Experiences With a Nylon Shirt, but some of it will have to wait

Until the next time,

BILL LAWRENCE

Personnel

LEO B. GRANT—has been appointed by Dow Chemical Company as manager of its New York sales office succeeding Ralph E. Dorland who held that position from 1919 until his death last May. Mr. Grant was associated with Dow's magnesium division in Midland, Michigan, for 20 years before joining the executive staff of its New York office about a year ago.

DR. ALFRED T. CLIFFORD above, who has become a member of the staff of Riegel Development Laboratories, Inc. at Ware Shoals, S. C. Dr. Clifford has been senior chemist with the Interchemical Corporation, Textile Colors Division, Fair Lawn, N. J. since 1943. Holder of B.S., M.S. and PhD. degrees from the University of North Carolina, Dr. Clifford was formerly a chemist at the Mellon Institute, research fellow at his alma mater, teacher at Davidson College and at Limestone College. Dr. Clifford belongs to the American Chemical Society, AATCC and Sigma Xi.

THREE PERSONNEL CHANGES—in the Nylon Division are announced by E. I. du Pont de Nemours & Company: A. J. SMITH, JR., district sales manager at New York for two years, has been transferred to the new nylon yarn plant at Chattanooga, Tenn. CHARLES E. du PONT, assistant district sales manager, has been promoted to sales manager at New York, succeeding Mr. Smith. ALEXANDER D. IRVING, II, a salesman in the New York office, succeeds Mr. du Pont as assistant district sales manager there.

HOWARD J. WHITE—one of the nation's authorities on synthetic fibers, has retired after nearly 34 years with E. I. du Pont de Nemours & Company. He was an assistant manager of the Rayon Department, which manufactures and sells viscose process rayon, acetate process rayon, nylon, "Orlon" acrylic fiber, and cellophane, among other products.

DR. ELIZABETH ADAMS and JOHN G. STICKLER have joined the staff of Bradford Durfee Technical Institute, Fall River, Mass., Dr. Adams as an instructor in Chemistry and Mr. Stickler as instructor in Textile Design. Dr. Adams has had 17 years teaching experience on the college level and for the past four years has been a research chemist in the Plastics Division of General Electric Laboratory at Pittsfield, Mass. Mr. Stickler has been with the Three Rivers Co., Whittenton Co., Pepperell Mfg. Co., and for the past five years has had full charge of all designing for the five mills of the Esmond Co.

BEN GOLD AND HENRY S. ROTH—have organized Gold-Roth Fabrics, Inc. to sell tie fabrics. Mr. Gold has been in the fabric business more than 30 years and was associated with Westerhoff Fabrics and S. J. Aronsohn in the past, while Mr. Roth has been with Wullschleger & Co. for 36 years. The new firm is taking over all facilities of Westerhoff Fabrics and will continue to sell the same type of merchandise to the same trade. At a later date, according to Mr. Roth, it is planned to enter the women's wear field.

PAUL STOCKER—has been named assistant to Al Huber, head of Verney Corp.'s fabric development and research division. He resigned from Du Pont January 15, as noted previously.

MORTON ENGEL—has joined the Wheatley division of Burlington Mills Corp. (N. Y.). He will be executive assistant to Adolph Klein, division head, and David Aranow, assistant division head. Mr. Engel was formerly associated with Dorset Fabrics, where he had charge of cotton goods converting and was assistant secretary of the company. Prior to that, he was for 10 years with Cohn-Hall-Marx in general converting work.

G. D. HARRISON—Lewiston Division, Pepperell Manufacturing Co., has been re-elected president of the National Association of Finishers of Textile Fabrics.

MALCOLM G. CHACE, JR.—treasurer and vice-president since 1935 of Berkshire Fine Spinning Associates, Inc., was named president of the firm at their recent quarterly meeting in Providence. JOHN H. McMAHON, president for the past 18 years, was named chairman of the board. Mr. Chace will retain the treasurership.

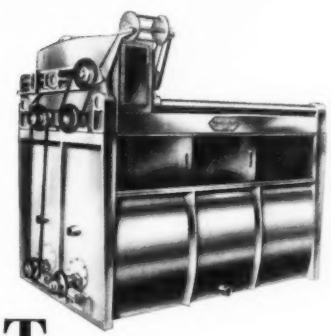
WILLIAM G. F. PRICE—has been elected president and a director of Belding-Heminway Co., and J. P. T. Armstrong, who has served as president since 1937 was elected chairman of the executive committee, the company makes known. Mr. Price has resigned as vice-president of the American National Bank and Trust Company, Chicago, to accept the new post, but continues as a director of the bank.

DR. M. L. CROSSLEY—a director of Research for the American Cyanamid Company, has received an honorary membership in the American Institute of Chemists in recognition of his work in the field of chemistry. The presentation was made at a joint meeting of the New Jersey Chapter of the A.I.C. and the North Jersey Section of the American Chemical Society on February 14 at the Hotel Winfield Scott, Elizabeth, N. J. Dr. Crossley, who recently received the honorary degree of Doctor of Science from Wesleyan University, Middletown, Conn., was awarded the 1947 gold medal of the A.I.C. for "noteworthy and outstanding service to the science of chemistry and the profession of chemist."

One of a series painted for Rodney Hunt by Ben Stephenson

FAMOUS FINISHES . . ***The Nova Scotian fishing schooner "Bluenose" wins the last of the famous International Fishermen's Races sailed off Gloucester in October 1938. Here the "Bluenose" is shown crossing the finish line a scant half mile ahead of her American rival the "Gertrude L. Thebaud."***

AND speaking of famous finishes, Dan River Mills, Inc., are famous for finishes, too. In their case — it's cottons and rayons. Dan River Mills were one of the first to install the new Rodney Hunt "Tensitrol" Washers, and are now setting new records for quality finishing at low production costs. By the way, have *you* the complete story on "Tensitrol"? It has proved to be the biggest news in finishing equipment in many a year. You are invited to turn the page for more specific information about "Finishing For Profit."



RODNEY HUNT

RODNEY HUNT

Established 1840

ORANGE 10, MASSACHUSETTS, U. S. A.

"Tensitrol," "Tru-Shade," "Slack Loop," "Wring-Master," and "Curve-of-Strength" are registered trade marks identifying textile finishing machinery manufactured exclusively by Rodney Hunt Machine Co.

Finishing For Profit

RODNEY HUNT

Established 1840

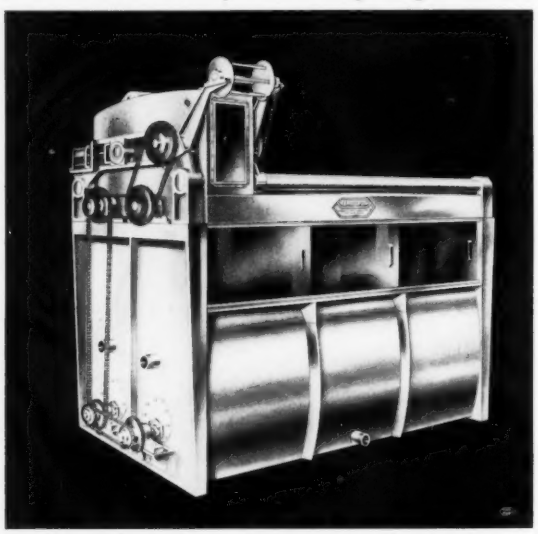
RODNEY HUNT MACHINE CO.

ORANGE 10, MASSACHUSETTS, U.S.A.

Poplins at 200 Yards per Minute in "Tensitrol" Rope Washers

EVERYONE was on edge. Both machines had been built by experienced men from reputable firms. Both were of gleaming stainless steel. Outwardly, the principal difference lay in the curved, strong-ribbed sides of one of the machines. Inwardly, it was the revolutionary design principle of this machine that created the air of tenseness.

Both machines were undergoing the same tests. At stake was more than a large commercial order; if the new design proved itself, it would answer a problem that had beset the textile industry since the beginning of time; it



would mean a giant stride toward quality finishing at sharply reduced cost.

More than 85,000 yards of fabrics were put through each of the washers — 48 miles of poplins, sheetings, dress goods, and other fabrics divided into 32 lots. When the results were scored, Rodney Hunt's new and revolutionary "Tensitrol" Rope Washer had:

1. Established a new peak in washing efficiency.
2. Proved that tensionless operation at that efficiency was possible for the first time in history.
3. Reduced horsepower requirements sharply.
4. Cut water consumption by more than 60%.

But, among the tests was one of *paramount importance to producers and finishers of poplins.* It involved the washing of heavier poplins, which had previously been done in open width form because of the almost certain development of rope marks.

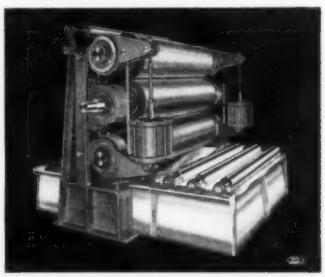
The completely tensionless operation of the "Tensitrol" Open Width Washer, together with the absence of nip rolls, has for the first time assured satisfactory processing of poplins. To be specific, caustic saturated poplins are being run at over 200 yards a minute on this machine and are being washed caustic free with a water consumption of 40 gallons a minute.

★ ★ ★

For Mercerizing At High Speeds

THE fifteen-ton Type RH Three Roll Saturator shown here is used in one of the highest speed mercerizing ranges on caustic impregnation in the country.

This patented saturating unit, complete with a stainless steel tank, has found widespread use for open width work in bleaching, mercerizing, and resin application throughout the country.



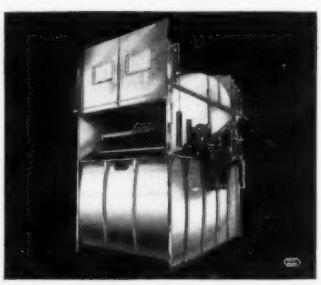
One of the famous "Wring-Master" line, the rolls automatically separate when air pressure is released. Instant and absolute control of pressures is assured.

"Wring-Master" Padders are readily available for all types of fabrics, for 'round-the-clock production or for experimental work.

★ ★ ★

Black to Pastels in Five Minutes

A simple hosing of this Combination Washer and Dye Kettle in use in a Rhode Island plant cleans the stainless steel in five minutes. A quick changeover from black to pastels, as an example, is a routine matter.



Hundreds of these Rodney Hunt machines, all with the patented "Curve-of-Strength" tub construction that prevents flexing while being emptied or filled, are in use throughout the world.

Compact and complete, they will take woolens or worsteds from a fulling mill, for example, rinse, wash, dye, rinse, speck dye, and rinse again, all without removing the material from the machine.

One of the most flexible machines in a woolen or worsted plant—this Combination Washer and Dye Kettle can serve exclusively as either a top efficiency stainless steel dye kettle, a stainless steel dolly washer, or as both combined.

★ ★ ★

If further information is desired on the above subjects, please address your inquiries to the Rodney Hunt Machine Co., Orange 10, Massachusetts, U.S.A.

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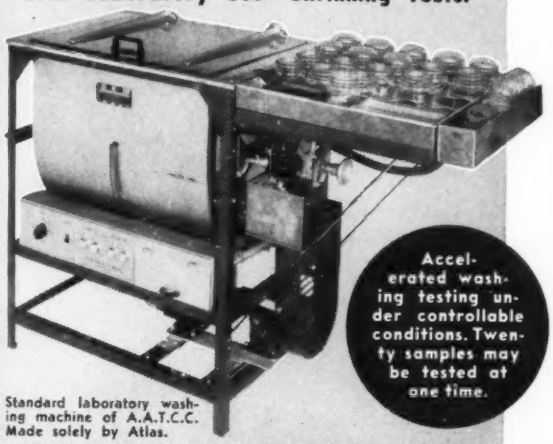

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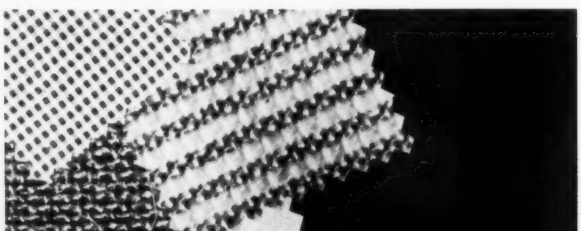

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FLOTEX is a colorless, clear-cooking thickener with long-flowing, non-jelling properties. It serves as a replacement and extender for relatively more expensive Tragacanth and other natural and synthetic gums for printing the colors listed at the right by either roller machine or screen methods. In addition, it produces sharp pegs, outlines—*and smooth, uniform blotch prints.* Write for a test sample.

National also produces: **AMBERTEX,** a heavy-bodied thickener for white discharge, direct and vat color printing; **CLEARFILM** for sheer, lustrous finishes; **VAT THICKENER 36** for vat colors on cotton and rayon; **TABLE ADHESIVE** for screen printing; **FLOCK ADHESIVE 970** for chenille flock printing; **HOOSIER PEARL CORN STARCH . . . THIN BOILING CORN STARCH . . . CHLORINATED CORN STARCH . . .** and **DEXTRINES.**

Address: 270 Madison Ave., New York 16; Boston, Philadelphia, Atlanta, New Orleans, Indianapolis, Chicago, San Francisco, and other principal cities. *In Canada:* Meredith, Simmons & Co., Ltd., Toronto and Montreal. *In Holland:* Nationale Zetmeelindustrie, N. V. Veendam.

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Very Good Fastness to Light

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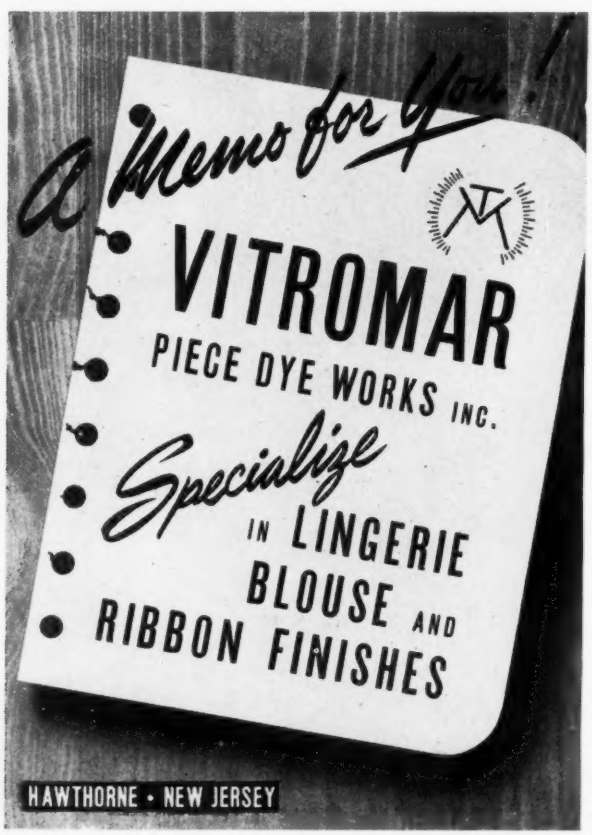

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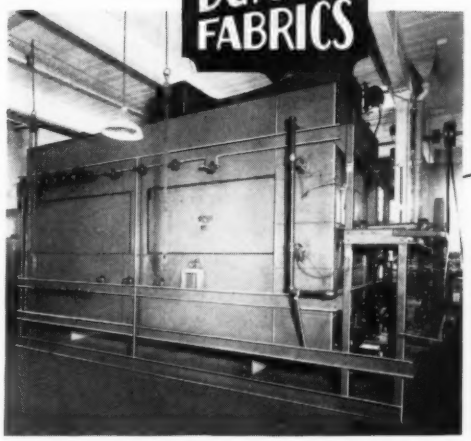

Dumari and its President, Walter O. Dunnock, have long been recognized in the Worth Street market for their ability to create something special and authoritative in American fabrics. For instance, their famous "Yippi", is a Tebilized, vat dyed spun rayon; is crease resistant, and has low residual shrinkage. It is but one example of Dumari creative authority.

For over twenty-five years Dumari Textile Co. has been a continuous customer at Apponaug. In addition to Tebilizing "Yippi", we also finish for them an extensive line of Piques, Dimities, Lawns, Voiles, etc.

Dumari is well acquainted with the taffeta-like hand that our own Apponized T imparts to all cotton goods. No need to tell them that it is durable and washable or that it has improved creasability and low residual shrinkage.

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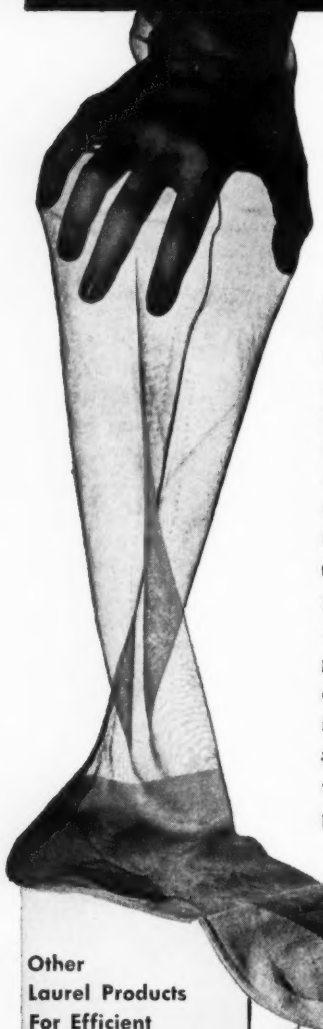

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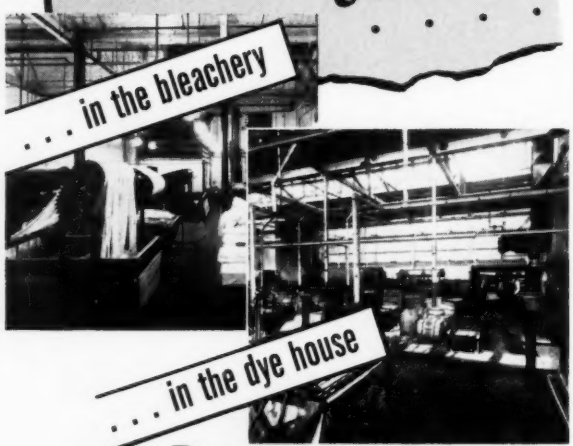

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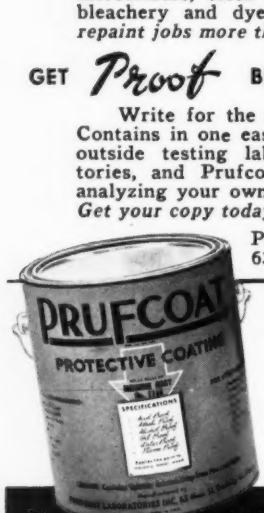

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The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery wanted or for sale—the rate is $7.50 per column inch or less per insertion.

WANTED:

Technical Sales Representative for Southern territory by old established chemical manufacturer. An unusual opportunity for a man having following qualifications: At least five years selling experience, actual textile mill experience preferred but not essential. Must have a knowledge of dyeing and finishing. Territory open Virginia, North and South Carolina. Established business. Car furnished. Only experienced men need apply. Salary commensurate with ability. References required, treated confidential.

Write Box No. 568

TEXTILE CHEMIST: Well established manufacturer NYC area seeking textile chemist with extensive knowledge and experience in manufacture and development of textile auxiliaries. Knowledge of dyeing and finishing preferable. Excellent prospects for right man. Write Box No. 420.

POSITION WANTED: Textile colorist three years experience in all fields of dyeing and matching colors on cotton, wool, rayon and nylon. Head of laboratory. Graduate of Textile H. S. age 24 married. Write Box No. 584.

SALES REPRESENTATIVE WANTED

Company, marketing a process and service of real importance to Textile Printers, offers good opportunity to representative who has following in New England, Pennsylvania and territories south. Attractive commissions. Write Box No. 581.

POSITION WANTED: Boss dyer, age 42, with 12 years experience in dyeing full fashioned, half hose, anklets and woolen piece goods, raw and carbonized stock wants position in south. Write Box No. 582.

CHEMIST WANTED: Up-to-date woolen mill wants young, experienced man who is familiar with all required practical laboratory tests. Write complete details to Box No. 588.

TEXTILE CHEMIST

For large manufacturer 1-2 years' experience for laboratory and technical service work. N. Y. C. Headquarters. State age, qualifications, salary. Write Box 598.

CHEMICAL SALESMEN: Opportunities for recent or 1949 college graduates, Chemistry Majors, in sales and service of fatty acids and textiles specialties. Textile chemicals preferred. Approximately 30, 60% traveling. Vacancies in East and Southeast areas. Age 21-34. Salary and expenses. Apply: EMERY INDUSTRIES, 4300 CAREW TOWER, CINCINNATI, OHIO. ATT. PERSONNEL ASSISTANT.

WANTED: EXPERIENCED TEXTILE CHEMIST, Northern New Jersey district, for textile-aid laboratory handling customers' requests and analysis of textile aids. State schooling and experience. Write Box No. 589.

POSITION WANTED: Technical Sales Representative. Graduate Chemist. Executive positions held in research and control laboratories of textile mill and industrial finishes manufacturing plant. Also actual mill experience in dyeing, finishing, printing of cotton. Formulation, research and customer service in industrial finishes. New England preferred. Write Box No. 590.

WANTED: Dyer for shift work in rayon piece dyehouse located in Province of Quebec. Reply, stating age, qualifications, experience and salary required. Write Box No. 591.

WANTED: Finisher for shift work in rayon piece goods plant located in Province of Quebec. Reply stating age, qualifications, experience and salary required. Write Box No. 592.

TECHNICAL SERVICE: To assist in servicing fatty chemicals and textile specialties. Desire advanced degree or equivalent in technical service or similar experience. To be located in Cincinnati area and involve some traveling; age 25-35. In reply provide resume including education, experience. Apply: EMERY INDUSTRIES, 4206 CAREW TOWER, CINCINNATI 2, OHIO, ATT.: PERSONNEL ASSISTANT.

WANTED: Chemist for small Northern New Jersey dyestuff manufacturer. Experienced in laboratory testing of cotton and woolen dyes and able to assist in product development. Write Box No. 596.

POSITION WANTED: Graduate textile chemist, 11 years' experience in textile research, control and production in rayon, upholstery and hat manufacturing. Desire research, production or technical sales. Philadelphia area preferred. Write Box No. 597.

• CLASSIFIED ADVERTISEMENTS •

ATTENTION EXECUTIVES: Do you need an assistant who can get things done? A chemist with post graduate education and training in business and industrial relations applies. Background: Technical sales, supervisor of dye laboratory and production chemist on detergents. Write Box No. 595.

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Manufacturer of Printing Ink Pigments and Dyes has opening for experienced Chemist. Excellent opportunity for early advancement to full charge of Production Control Laboratory. Location in New Jersey Metropolitan area. Reply, giving resume of experience and personal data which will be treated confidentially.

Write Box No. 593

OPPORTUNITY—Chemical specialty manufacturer of high reputation, old company, large research staff producing unusual products, is looking for two salesmen. They must be experienced, have a good following and high reputation in textile mill circles. Salary and commission. Opportunity to advance to salesmanagership. Write Box No. 594.

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THE COMPOUND OF MANY USES

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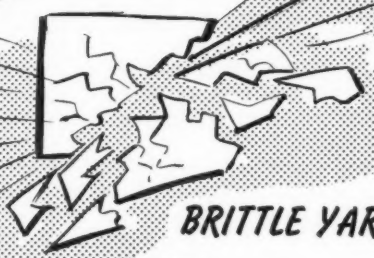

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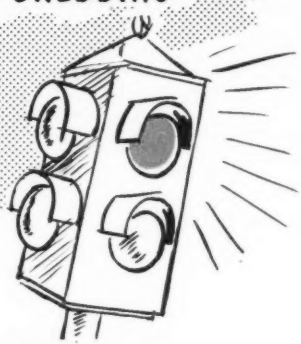

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